

# FORMAL ENGLISH GRAMMAR AS A DISCIPLINE

By

THOMAS H. BRIGGS *not grammar*

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIRE-  
MENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY,  
IN THE FACULTY OF PHILOSOPHY, COLUMBIA UNIVERSITY

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T. H. B.

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# TEACHERS COLLEGE RECORD

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## FORMAL ENGLISH GRAMMAR AS A DISCIPLINE

### PART I

#### HISTORICAL SKETCH OF GRAMMAR AND THE TEACHING OF GRAMMAR

The grammar that is commonly taught in elementary schools to-day has a long and unbroken descent to us from its origin in Greece. Though in every age called grammar, it has not always had the same content and purposes; both indeed have changed so often that definiteness demands a careful explanation of the term whenever it is used. They will be better understood, too, after an acquaintance with the development of the subject in the school curricula, a full history of which is yet to be written.<sup>1</sup>

The origin of grammar was in philosophy, which still divides the subject with the elementary school; but so slowly were even the fundamental facts discovered that Aristotle in his wisdom knew nothing of adverbs and tenses as such. Already in the fourth century B.C. there existed, however, two "schools"—the Analogists, who maintained that there was between word and idea a mysterious union which made impossible any exceptions to grammatical rules; and the Anomalists, who denied general rules of any kind unless they were justified by custom. After a long contest the former school, as strange as it may seem, won the field, which it maintained chiefly by tradition for

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<sup>1</sup> Most of the facts in the following sketch were drawn from the article on Grammar by Sayce in the *Encyclopedia Britannica*, Abelson's *The Seven Liberal Arts*, Mullinger's *Schools of Charles the Great*, Barbour's *The Teaching of English Grammar*, Monroe's *A Text-Book in the History of Education*, and Carpenter, Baker & Scott's *The Teaching of English*.

many centuries—indeed, it has not even yet been entirely driven forth.

But in Greece, grammar acquired a large meaning and a practical value. As one of the Seven Liberal Arts it included first and last even more than we understand now by language and literature. In its narrow sense it was used practically by the Sophists to aid them in their rhetorical contests; in its comprehensive sense, by all Greek scholars to instruct the youth in culture.

As a practical study grammar was introduced into Rome primarily that scholars might learn the Greek language and participate in the literature which it had been used to express. This practical value, prominent throughout the Hellenistic period (from 200 B.C. to 100 A.D.), was emphasized by Dionysius Thrax, who in the first prechristian century wrote for Romans his Greek grammar. This became the basis of several grammars of the Latin tongue; the adapting authors, anticipating their English descendants, not only misunderstood and mistranslated their originals, but failed to realize that the grammar of one language is not identical with that of another. Partly as a result of this artificiality, grammar must have readily shared in the degeneration of all intellectual life after the time of Suetonius, retaining only its form. This, however, was assiduously studied.

At first the Christian Church had no interest in grammar, rejecting it along with everything else pagan. But after the church felt itself secure, especially as it recognized the need of organized linguistic facts for the priests who had to learn to read the Scriptures, this hostility slowly dissipated. Then began the general use of two text-books, the "*Ars Grammatica Minor*," through which Donatus in the fourth century presented the organization of syntax that the systematizing Roman mind had developed, and the "*Institutio de Arte*," through which Priscian a century later attempted to put the grammar of Latin on the same scientific footing as that of Greek.

There was no such agreement, however, regarding content as there was regarding texts. Cassiodorus considered grammar to embrace literature; Isidore of Seville called it "*et origo et fundamentum liberalium literarum*"; and Rabanus Maurus repeated the statement adding that it was "*scientia interpretandi*



poetas atque historicos et recte scribendi loquendique ratio." But there is evidence that these ideals were not followed in general practice. After Gregory the Great the original interpretation of the study of grammar, according to Mullinger, dwindled to nothing more than a technical knowledge of the Latin language. This was mastered primarily as a means to acquire the universal language of scholars. Alcuin, among others, scrupulously abstains from dwelling on literature as an aspect of grammar. In his "Disputatio" we find how formal a matter he considers it. "Grammar is the science of letters, the guardian of language and of correct style. It is founded on nature, reason, authority, and usage. It is divided into 26 'species'; to wit, words, letters, syllables, clauses, sayings, speeches, definitions, feet, accents, punctuations, critical works, orthographies, analogies, etymologies, glosses, differences, barbarisms, solecisms, faults, metaplasms, schemata, tropes, prose, meter, fables, and histories."

He writes, further, that the syllable has "three accents—the acute, the grave, and the circumflex; two breathings, hard and soft; quantity, two short syllables being equivalent to one long; and number, according to the letters of which it is composed." We get even a clearer idea of the formalism involved when we realize that Alcuin, who was inaccurate even in the small Greek he did know, was discussing not Greek grammar, but *grammar*.

During the period of Scholasticism there was a shrinking of the content of grammar; and at the universities there developed an exaggeration of the disposition to reason about details, a disposition that has always, early and late, shown itself. The chief text after 1199 was Alexander de Villedieu's "Doctrinale," less than a fifth of which was devoted to syntax. With this book as a text Scholasticism, caring little for the validity of grammar, taught it as a deductive science; and in the monasteries used it as a discipline or occupation for idle time. There is small wonder, then, that the Humanists in the fifteenth century directed their first attack against the "Doctrinale." But when the spirit went from their movement the Humanists incorporated much of the book into their own texts. Within two generations there had been another change from substance back again to form.

But in all these centuries, however much had been taken out of the content of grammar, there was a real need for the essentials of the subject as a means of acquiring the universal language of scholarship. Even in the seventeenth century Comenius wrote,<sup>2</sup> "I presume that no one can raise any objection to my placing [Latin] grammar first, since it is the key of all knowledge." There was a disposition, however, to doubt even that fact. Locke<sup>3</sup> somewhat later declared, "I would fain have anyone name to me that Tongue, that anyone can learn, or speak as he should do, by the rules of Grammar. Languages were made not by Rules or Art, but by Accident, and the Common Use of the People." And whether Locke was right or not, the chief reason for the study of Latin grammar by English people passed when the language of scholarship became the vernacular.

The first so-called English grammar was the Introduction, written by John Colet about 1542, to Lily's "Latin Grammar." The whole book was by royal command taught throughout the realm and thus became the standard of grammatical reference for two hundred years. This introduction to King Henry's Grammar and its successors "were not properly English grammars at all; they were translations of the Latin *accidence* and were designed to aid the pupil in the acquisition of Latin." The appearance of these books, based on a belief that the study of Latin did not give a ready and effective command of the mother tongue, presaged good; but partly because of the general study of Latin and Greek in the schools, partly because authors and masters alike were "accustomed to mechanical methods of dealing with facts of a dead language, known to them almost entirely in its somewhat artificial literary form," the grammar was English in name only. With a complex organization, almost without exception on the skeleton of orthography, etymology, syntax, and prosody, these books through an attempt to apply the rules of a highly inflected language to English were absurdly artificial. Blinded themselves to the genius of the English language, the authors established a tradition which has continued to blind the eyes of schoolmen even to the present day. It was bad enough for the authors to

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<sup>2</sup> Great Didactic, Chap. XXX.

<sup>3</sup> Thoughts Concerning Education, Sec. 168.

believe that the only sure means of acquiring the art of speaking and writing correctly was through the memorizing of formal grammatical rules; it was far worse that they presented rules derived from the facts of another language and applicable with entire truth only to it. The transfer of grammar from Latin to English, like its transfer from Greek to Latin, carried over much that was untrue and hence wasteful in the schools.

The authors of texts nearly all agreed in calling grammar an art; they presented, however, rules to be committed, sentences to be parsed or analyzed, and faulty diction to be corrected. Their ideal was that children, for by this time the subject had been transferred gradually from philosophers to children, should understand the syntactical laws of the language and should acquire skill in logical analysis. Holding this ideal Lindley Murray in 1795 published a grammar which on account of its relative simplicity became the most popular text for many years. In 1823 Kirkham further simplified and adapted the subject for children in his "English Grammar in Familiar Lectures." It was about this time that English grammar took its place alongside Latin grammar as a common study in the elementary school. This book had the practical advantage of demanding the immediate application of rules to sentences, and it also presented a new Systematic Order of Parsing, which, however economical of the teachers' time, fixed a deadening outline on recitations for two generations. A further advance was proposed in the "English Analysis," by Green, published in 1847. Green in his advocacy of the analysis of whole sentences and also sentence building may be termed the progenitor of the modern idea of discipline through grammar and of language books. One may get a good idea of the severity of the discipline that he demanded by examining his distinction between subject and predicate attribute.

From this time forward almost every phase of grammar can be found in the rapidly multiplying texts, but three lines of development are fairly distinct. The first was logical and metaphysical, drawing its strength largely from the complexity of the subject and the interest that philosophers have always evinced in it. The authors attempted to present an adult, scholarly interest to children. The second was historical. With

the increased knowledge of comparative linguistics there was a demand from scholarship for greater historical accuracy in the treatment of grammar in school texts; Goold Brown, for instance, thought Kirkham very reprehensible because he considered words "without any regard to their ancient construction and application." The third line continued the old tradition of grammar as a deductive science, presenting a definition followed by examples and an exercise. Of this type the "Essentials of English Grammar" by Whitney is the most conspicuous.

The text-books in current use may be roughly divided into two classes: the first professes to apply traditional grammar practically to language; the second, following the laboratory practice of other subjects, has made grammar an inductive science. The old yields slowly. In the books of the first class many details persist by the sole authority of tradition; in those of the second, they are justified, openly or implicitly, as affording a general discipline of the mental powers. This theory has gained adherence in proportion to the need felt for justifying existing practice.

This sketch has attempted to show that modern grammar was born of philosophy and still is held in close relationship to it; that recurrently there have arisen new conditions which demand a modification of the purpose and content of the subject; that with every change tradition has perpetuated details which had lost much or all of their justification; and that when old reasons have faded there is a tendency to invent new ones to justify practice. The purpose of the following study is to ascertain, so far as possible, if the claims that formal grammar is an effective discipline are sound.



## PART II

### GENERAL CLAIMS FOR GRAMMAR

The claims for modern English grammar to a place in the elementary school curriculum have been well formulated by Hoyt.<sup>1</sup> He found after "a survey of current pedagogical literature and a canvas of the opinions of a number of teachers of grammar," that "there is a remarkable consensus of opinion as to the object of teaching grammar, and consequently in the arguments advanced to justify its being taught."

"It is asserted," Hoyt records, "that grammar—

- (1) disciplines the mind;
- (2) prepares for the study of other languages;
- (3) gives command of an indispensable terminology;
- (4) enables one to use better English;
- (5) aids in the interpretation of literature."

A further investigation, especially of publications since 1906, reveals no further claims.

#### *Formal Grammar Defined*

It is obvious that the first of these claims concerns formal grammar, by which is meant grammar highly organized and taught as a strict science, chiefly for its own sake or as a discipline for the mind. Particular attention may or may not be paid to the elements that function in the interpretation of literature or in expression through language. It is certain to introduce many elements that have no such functional value. Indeed, in the strictest sense the worth of any fact in formal grammar is determined by its function in a logical scheme rather than by any significance in the uses of life. This distinction between formal and functional grammar should be carefully made and kept in mind, for a failure to discriminate here

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<sup>1</sup>The Place of Grammar in the Elementary School Curriculum, *Teachers College Record*, November, 1906.

beclouds the issue and frequently results in needless controversy over the value of grammar as a school subject. Holmes, in the leaflet of The New England Association of Teachers of English for March, 1913, seems to have in mind a disciplinary grammar,<sup>2</sup> but his whole argument is for the elements that contribute directly to conservative correctness, the acquiring of a foreign language, and effective composition. Brown, likewise, in *The English Journal*<sup>3</sup> makes his third topic "grammar as a disciplinary study." But under this head he argues only that many of our school texts in grammar contain unscientific conflicts of statement or avoidable inconsistencies of grouping. The fact that a functional type of grammar may be highly effective in schools does not warrant the highly formal type, neither alone nor in combination with immediately practical elements.

Almost everywhere in pedagogical literature emphasis is laid on the claim that grammar "disciplines the mind." Even authors who believe that less time should be given in the elementary schools to grammar as a science,<sup>4</sup> assert that the most important of the functions of grammar is undoubtedly a training in thought. Many writers advance this claim as the only one of great value; for example, the Committee of Ten<sup>5</sup> asserts that "the study of formal grammar is valuable as training in thought, but has only an indirect bearing on the art of writing and speaking"; and Gowdy<sup>6</sup> writes, "The purpose of language books and rhetorics is to give practical help in the art of speaking and writing correctly and effectively. Grammar, on the contrary, is a science. It is pre-eminently a disciplinary study." It is notable that in her revised edition (1909) Gowdy omits this statement, but retains the identical plan and purpose of her book. Buck,<sup>7</sup> while arguing that school texts in grammar are frequently unscientific, frankly says, "We know that the study of English grammar has long since ceased to justify itself as a practical art."

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<sup>2</sup>He says, *inter alia*, that grammar "shall parallel and stimulate the development of the thinking processes." Page 4.

<sup>3</sup>February, 1913.

<sup>4</sup>E.g., Carpenter, Baker & Scott, *The Teaching of English*, p. 146. (1903.)

<sup>5</sup>Report of the Committee of Ten, p. 89. (1893.)

<sup>6</sup>English Grammar, p. iv. (1901.)

<sup>7</sup>*School Review*, XVII, 29-30.

*General Claims for Formal Grammar as a Discipline*

Barbour<sup>8</sup> declares that grammar "has no superior in the school curriculum, and no substitute in the school curriculum, as a discipline of the logical faculties." Chubb,<sup>9</sup> although an advocate of functional rather than of formal grammar, thinks that English grammar is superior to that of Latin and Greek because "reason replaces memory; thought-evidence, the sense evidence of inflection. . . . Hence its superior disciplinary value, save in the matter of mere memorizing." Woodward<sup>10</sup> is another who thinks that as a discipline English grammar is superior to the classics. And Hinsdale<sup>11</sup> compares the disciplinary value of grammar with that of the other sciences in the school curricula.

Laurie<sup>12</sup> repeatedly voices the disciplinary claim. "I will now conclude," he writes, "that language, as formal, is the most effective and universal of all pure *disciplines* possible in the school. . . ."<sup>13</sup> And further<sup>14</sup> he declares that by formal grammar we "strengthen reason for all particular exercises of whatever kind," and even acquire a "moral discipline."<sup>15</sup> One more quotation<sup>16</sup> from Laurie clearly presents the claim for grammar as a disciplinary means:

"The occupation of the intelligence with the abstract is, as I have said, in a special degree, a discipline, because in contemplating the abstract we are not far from the contemplation of mind itself in its nakedness as a living process, and are thus making an almost direct acquaintance with the organon of all knowledge. But this is not in the truest and fullest sense education, but only that part of it which we call discipline; it is to be compared to the sharpening of the edge of a tool and the strengthening of the body of it for some practical purpose. Grammar, as the logic of common speech, is a system of abstractions."

Leonard<sup>17</sup> is another writer on methods who over and over

<sup>8</sup> The Teaching of English Grammar, p. 30. (1901.)

<sup>9</sup> The Teaching of English, pp. 208-209. (1902.)

<sup>10</sup> Study of English in the Schools. (1887.)

<sup>11</sup> Teaching the Language-Arts, p. 156. (1896.)

<sup>12</sup> Language and Linguistic Method. (Second edition, 1893.)

<sup>13</sup> *Loc. cit.*, p. 13.

<sup>14</sup> Pages 23-24.

<sup>15</sup> Page 8.

<sup>16</sup> Page 66.

<sup>17</sup> Grammar and Its Reasons. (1907.)

again asserts that "the best result of the study of grammar is a logical habit of mind." She maintains that "in the discussion of the subtler question of syntax it is not the decision reached that is of chief importance. It is the power of thinking gained by the effort to compare and discriminate the relations of a thought that is of truest educational value."<sup>18</sup>

And Sheffield, who protests against the unscientific attitude of most texts on modern English, holds<sup>19</sup> that "the grammar of one's mother tongue must justify itself as a discipline, imparting insight into the nature of the language-medium." He thinks, however, that "no result so fruitful can now be claimed for school work in English," and, further,<sup>20</sup> that "the mind is not to be trained by a routine of mental pulley-weights, for the power to think, like the will to do right, develops best as a by-product of effort directed upon something worth while in itself." Leonard, on the other hand, is more optimistic. She argues<sup>21</sup> that if the teacher of grammar sees no results he need not be discouraged. With a faith born of hope she thus encourages the credulous, even if she does not convince the scientific:

"Let him [the teacher] take up this necessary subject of English grammar with courageous heart, feeling sure that faithful work along this line is sure in its own time and way to contribute large and important elements to the comprehensive end which is perhaps the highest result of education, namely, the perfection of thought and its fitting expression."

These quotations from writers on the composition of the curriculum and its method fairly well represent, too, the attitude of the makers of school text-books. Some very frankly in their prefaces make the claim of general disciplinary value, while others, especially during recent years, give no such reason for the study of grammar but follow in the body of the book the same plan as those who do. Even in those books that lay much emphasis on the application of grammar to composition there are retained many details—elaborate treatment of the noun used as an adverb, for instance, or a distinction between a subordinate conjunction and a conjunctive adverb—that can be justified in

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<sup>18</sup> Page 349.

<sup>19</sup> Grammar and Thinking, p. 2. (1912.)

<sup>20</sup> *Loc. cit.*, p. 190.

<sup>21</sup> *Loc. cit.*, p. 350.



an elementary school study only as a means for training the mind to general habits.

*Specific Claims for Formal Grammar as a Discipline*

But these claims for grammar are too general. On reading them any thoughtful person is likely to ask, "Just what do they mean?" A definite answer to this question is much more difficult to find, most writers on theory as well as practically all writers of texts resting content with the general statement. Even when they do attempt to make the claims for grammar specific, they use language that is difficult to translate into terms of the fifth to eight grade teaching. Hinsdale,<sup>22</sup> for example, writes:

"The study involves a peculiar exercise of the powers of observation—the forms of words, idioms, and sentences, and of the realities that are behind them, distinctions, meanings, and relations. These forms and relations develop a kind of sense or perception that external objects do not develop. Secondly, the study involves also a vigorous exercise of the logical powers—analysis, abstraction, comparison, inference. Grammar is the application of logic to a large and important class of facts. The powers of thought are developed by studying the relations of objects, external and internal. The first rank far below the second in educational value. . . . Power of abstract thought is promoted most directly and effectively, as Professor Laurie says, 'by formal or abstract studies, such as arithmetic, mathematics, grammar, logic; and this because the occupation of the mind with the abstract is the nearest approach to the occupation of the mind with itself as an organism of thinking.' Grammar is indeed the only metaphysical study that a large majority of people ever pursue; and if that would be a defective information which ignored the facts of language, *a fortiori* would that be a defective discipline which omitted its relations."

And in the report of the Committee of Fifteen on Correlation of Studies, a report that advocates five lessons of grammar a week, with a text-book, the latter half of the fifth year and all of the sixth and seventh, we find:<sup>23</sup>

"Grammar is the science of language, and as the first of the seven liberal arts it has long held sway in school as the disciplin-

<sup>22</sup> Teaching the Language-Arts, pp. 156-157. (1896.)

<sup>23</sup> Report of the Sub-Committee on The Correlation of Studies in Elementary Education, pp. 48-49. (1895.)

ary study *par excellence*. A survey of its educational value, subjective and objective, usually produces the conviction that it is to retain the first place in the future. Its chief objective advantage is that it shows the structure of language, and the logical forms of subject, predicate, and modifier, thus revealing the essential nature of thought itself, the most important of all objects because it is self-object. On the subjective or psychological side, grammar demonstrates its title to the first place by its use as a discipline in subtle analysis, in logical division and classification, in the art of questioning, and in the mental accomplishment of making exact definitions. Nor is this an empty, formal discipline, for its subject matter, language, is a product of the reason of a people not as individuals but as a social whole, and the vocabulary holds in its store of words the generalized store of experience of that people, including sensuous observation and reflection, feeling and emotion, instinct and volition."

After a consideration of all the specific claims that could be found for formal grammar in the writings of educational theorists, of the contents of a number of widely used grammar texts, and of the opinions of several writers of grammars, who were kind enough to set down categorically their beliefs in the subject, the following conclusions were drawn: It is held that work in formal grammar trains children

A. with rules or definitions:

1. to see likenesses and differences,
2. to critically test a definition,
3. to thoroughly apply a definition,
4. to make a rule or definition;

B. with reasoning:

5. to test reasons,
- 6a. to take from a mass of data all that are necessary and to use them in reaching a judgment,
- 6b. to demand all necessary data before drawing a conclusion,
7. to reason in other fields, e.g., in arithmetic,
8. to reason syllogistically,
9. to detect "catches."

#### *Common Fallacies in the Argument*

These claims certainly should justify all the time and labor given to formal grammar,—providing, of course, that they are

true. But who knows that they are? Who knows, indeed, that they are not? There are opinions enough expressed, dogmatically and without reserve; but, unfortunately for certitude, these opinions are often in direct contradiction one with another. Introspection and the oracular utterances of those who "have observed thousands of boys and girls" must be rejected as conclusive evidence of the value of a study if for no other reason than that practically as much will be on one side as on the other. Such judgments are unsafe, further, because not infrequently the judge considers only that evidence which tends to confirm a previously accepted position.

Two fallacies usually invalidate the conclusions of those who base their judgments on observations merely of the product of the schools. The first is the *post hoc* fallacy. Because a pupil has studied a formal subject in the grades and afterwards proves to have keen intellectual powers, he is adjudged to have attained, or at least to have improved, them through such study. No one knows, of course, that this is true; the formal subject may have made no difference at all, or indeed it may have retarded the pupil's intellectual progress. The second is the selective fallacy. The result of our promotional systems is grade by grade to eliminate among others those of least mental inheritance. As a result, the most able are left for the formal studies of the upper grades; and in these studies the best of the selected class will naturally take the highest rank. It does not follow that they are the best intellectually because of the studies; whatever effect the studies may have upon the pupils, it certainly is true that they rank high in the classes because of natural ability and application.

Nor does it prove anything to say that the best members of a class when well taught a formal subject enjoy it. As Thorndike has shown,<sup>24</sup> there is an instinct of multiform mental activity which results in a naïve satisfaction. It quite easily follows that the greater the difficulties that one can overcome, the greater the sense of self-power and consequently of satisfaction. As a result of this it need cause no surprise that some pupils become tremendously interested by grammatical subtleties. Jespersen

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<sup>24</sup> The Original Nature of Man, pp. 141ff. (1913.)

has declared,<sup>25</sup> "I think that the study of grammar is really more or less useless, but that it is extremely fascinating." But just as the opinions of other observers are not conclusive for the value of grammar in training the minds of children, so the opinion of Jespersen, however great a grammarian he may be, is not conclusive against its practical value.

### *Lack of Experimental Evidence*

It seems strange, at first thought, that there is at hand no experimental evidence concerning the value of formal grammar as a discipline. The unanimity with which psychologists have discarded the old ideas of universal transfer along with its basis, the "faculty psychology," has at least put under suspicion such claims for grammar as have been quoted. It would seem that the burden of proof is upon those who make the claims. It is certainly not convincing for them to repeat, and even to extend, claims which, in their origin, were based on a psychology that now is held by no one who knows the modern literature of science. The burden of proof rests chiefly on those who make the claims for formal grammar but partly also on those who now reason, by analogy from the results of artificial laboratory experiments, against the general value of the subject. As the analogy of the "blacksmith's right arm," however convincing it sounded a score of years ago, has proved a false one, so likewise analogies between exercise in grammar and exercise in canceling A's, drawing lines, or throwing a ball, may be, but are far less likely to be, unsound.

But on second thought, it is easy to see why there have not been experiments of transfer from formal grammar studied in the classroom. In the first place, it is difficult to devise tests that convincingly measure mental ability in seeing likenesses, forming a judgment, etc. Then it is even more difficult to secure for so continued an experiment as is necessary groups of children who are sufficiently alike in natural traits and training. And, finally, it is tedious to conduct the experiment through several months and then to compute the results. No such experiment has hitherto been reported, so far as an examination

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<sup>25</sup> *School Review*, XVIII, 530.



of the most important English and German journals of psychology and of pedagogy has revealed.

### *Experiment Devised*

Since it is obvious that increase in a child's ability through the study of formal grammar to see likenesses and differences, to critically test a definition, etc., is not of great worth if this increased ability extends no further than the field of grammar itself, there was devised a series of tests of these abilities in other fields—some artificial and some such as occur in school or in life. Tests numbered 13-14, 21-24, 27-34 are from Bonser's study of "The Reasoning Ability of Children";<sup>26</sup> tests 43-49 are from Woodworth and Wells's "Association Tests";<sup>27</sup> and a number of the "catches" in 45-46 are from Whipple's "Manual of Mental and Physical Tests."<sup>28</sup>

### *The Tests*

#### *Practice Sheet*

1. One half of the following sixteen sums are alike in one respect and in that respect unlike all the other sums in the list. Find the eight sums and mark them with a check (✓).

$5 + 3$	$6 - 2 - 1$	$9 + 1 \div 5$	$4 + 11 + 2$
$9 - 4$	$6 \div 3 - 2$	$9 \times 2 - 4$	$2 + 9$
$5 + 5 + 4$	$6 - 2 \times 5$	$8 - 2 \div 4$	$7 \times 4 - 2$
$6 \div 2 + 1$	$3 + 7 \times 5$	$2 \times 8 + 7$	$7 - 2$

2. What rule for spelling can you make that will apply to the following derivative words?

ladies	libraries
babies	bodies
lilies	companies

3. State all the ways in which these words are alike.

hate	have	hide
------	------	------

4. Change this definition in any way to make it correct.

A quadruped is a domestic animal.

<sup>26</sup> Teachers College Contributions to Education No. 37. (1910.)

<sup>27</sup> Psychological Review Monographs, 1910.

<sup>28</sup> Warwick and York, Inc., 1910.

5. Animals are carnivorous if they feed on flesh. Mark a heavy line through each of the following words that names a carnivorous animal.

lion	sheep
duck	tiger
horse	dog

6. If this argument is unsound, briefly tell why.

All bricks are made of clay. This vase is made of clay. Therefore this vase is a brick.

7. If a goose standing on one foot weighs eight pounds, what will it weigh standing on two feet?

8. To the right of each of the words in the following list write a word that means exactly the opposite.

left—	ugly—
in—	fat—
noon—	incorrect—

9.

left—right	fat—
shoot—bird	lend—
oak—tree	banana—
color—blue	tool—
elbow—arm	page—
apple—seed	clock—
baby—cries	dog—
gallops—horse	bites—
sharp—razor	hot—
penny—copper	nail—

### *Group I.*

Numbers 1-10 were to test the ability to see likenesses and differences. In 1 half the words are singular. (Eight of the words also happen to represent inanimate objects, and eight others two-syllable words); in 2 half are monosyllabic; in 3 half are nonsense words; in 4 half the numbers are multiples of 3; in 5 half the leaves are palmate veined; and in 6 half are serrate edged. In 7 and 8 the sentences in each group are alike in a number of ways,—a number so large that it is even approached by no one pupil. In 9 and 10 there is a difference in meaning in each pair of sentences except the second of number

10, which was designed as a catch. Unfortunately for the success of tests 9 and 10 as a measure, the difference in meaning is in some cases more easily seen than expressed.

## TEST 1

One half of the following sixteen words are alike in one respect and in that respect unlike all the other words in the list. Find these eight words and mark them with a check (✓).

biscuit	pirate	mountain	men
oxen	geese	fathers-in-law	factory
scholars	knives	vessel	table
pole	frame	children	mice

## TEST 2

One half of the following sixteen words are alike in one respect and in that respect unlike all the other words in the list. Find these eight words and mark them with a check (✓).

queue	ended	thorough	annoy
bore	excellent	as	educational
truly	manipulate	sawing	good
through	splint	sprout	cat

## TEST 3

One half of the following sixteen words are alike in one respect and in that respect unlike all the other words in the list. Find these eight words and mark them with a check (✓).

bek	ribbon	bugler	bokmit
bikreb	bukder	seb	rudest
butter	big	begin	bak
sabsed	sibtad	rob	baggage

## TEST 4

One half of the following sixteen numbers are alike in one respect and in that respect unlike all the other numbers in the list. Find these eight numbers and mark them with a check (✓).

5	21	3	8
11	4	13	41
9	19	39	18
63	6	12	26

## TEST 5

One half of the sixteen leaves pictured below are alike in one respect and in that respect unlike all the other leaves pictured. Find these eight leaves and write their numbers here:—



(Reduced to  $\frac{3}{4}$  of original size).



## TEST 6

One half of the sixteen leaves pictured below are alike in one respect and in that respect unlike all the other leaves pictured. Find these eight leaves and write their numbers here:—



(Reduced to  $\frac{3}{4}$  of original size).

## TEST 7

State all the ways in which these sentences are alike.

1. John sang two German songs about birds and trees.
2. Indian women gave Mary several baskets of ripe fruit.
3. The American boys and Arthur were busy all day.

## TEST 8

State all the ways in which these sentences are alike.

1. I think he is guilty, for he is nervous and apparently uncomfortable.
2. Are you happy merely because this is June?
3. You fail to be alarmed; but as the doctor has had much experience with overworked men, you should take his advice.

## TEST 9

How does the first sentence in each of the following pairs differ in meaning from the second?

1. a) John held the lines tight.  
b) John held the lines tightly.
2. a) It was Mr. Jones whom I meant.  
b) It was the Mr. Jones whom I meant.
3. a) The month before he had visited his cousin.  
b) A month before he had visited his cousin.

## TEST 10

How does the first sentence in each of the following pairs differ in meaning from the second?

1. a) There was a crown offered Cæsar.  
b) There a crown was offered Cæsar.
2. a) John sent his friends an outline of the plan.  
b) John sent an outline of the plan to his friends.
3. a) Will only lent me fifty dollars.  
b) Will lent me only fifty dollars.

*Group II.*

Numbers 11-12 were to test the ability to judge a definition; numbers 13-14 to test the ability to judge a definition and to amend it when faulty.

## TEST 11

In the following definitions, place a small cross, like this, +, before those which you think are good ones, doing it as quickly as you can.

a. Definitions of a *shoe*.

1. A portion of clothing.
2. Something black made of leather.
3. A protective covering for the feet, usually made of leather, having a firm bottom or sole and flexible upper portions, an opening for the foot being fastened by lacings, buttons, or buckles.
4. Something to wear on the feet.
5. A necessary article costing from one to five or six dollars.

b. Definitions of an *island*.

1. A piece of land out in the water.
2. A small body of land.
3. A body of land entirely surrounded by water.
4. Cuba is an island.
5. A portion of land rising above the surrounding level.

c. Definitions of *to explode*.

1. To burst suddenly with a loud noise.
2. To knock all to pieces.
3. To make a very loud noise.
4. To fill the air with a tumultuous roar.
5. To blow up.

## TEST 12

In the following definitions, place a small cross, like this, +, before those which you think are good ones, doing it as quickly as you can.

a. Definitions of a *chair*.

1. A piece of household furniture.
2. A movable seat with a back intended for one person.
3. A piece of furniture on which to sit.
4. Rocking chairs are comfortable chairs.
5. A single seat having a back.

b. Definitions of *to write*.

1. To make words with a pen or pencil.
2. To make characters which stand for ideas.
3. To use a pen or pencil.

4. To make marks on any kind of surface with any kind of an instrument which will express one's ideas so that another may understand them.

5. To write a letter.

c. Definitions of a *buggy*.

1. A buggy is black.
2. A buggy is something to ride in.
3. A buggy is a light, four wheeled vehicle, with or without a top or covering, designed for carrying two or three persons.
4. A buggy is drawn by horses.
5. A buggy may have rubber tires.

TEST 13

Some of the following definitions are incorrect. Change in any way to make them exactly true.

1. A square is a figure all of whose sides are equal and all of whose angles are equal.
2. Writing is the expression of facts to the eye.
3. The circumference of a circle is a curved line which has no beginning and no end.
4. An island is a body of land, usually of moderate extent, entirely surrounded by water.

TEST 14

Some of the following definitions are incorrect. Change in any way necessary to make them exactly true.

1. Reading is getting the sounds of words from seeing them.
2. A prime number is a number divisible without a remainder by no whole number except itself and one.
3. A sphere is a body of wood all points in whose surface are equally distant from one point within.
4. A bay is a small piece of the ocean near the land.

*Group III.*

Numbers 15-24 were to test the ability to thoroughly apply a definition. In numbers 21-24 the children were told to apply each definition whether or not they believed it to be a good one.

## TEST 15

A figure is *radially symmetrical* if it has parts exactly alike regularly arranged about a center.

Mark a heavy line through each figure that is radially symmetrical.



(Reduced to  $\frac{3}{4}$  of original size).

## TEST 16

A figure is *bilaterally symmetrical* if it can be divided by a straight line into two parts that are exactly alike.

Mark a heavy line through each figure that is bilaterally symmetrical.



(Reduced to  $\frac{1}{2}$  of original size).

## TEST 17

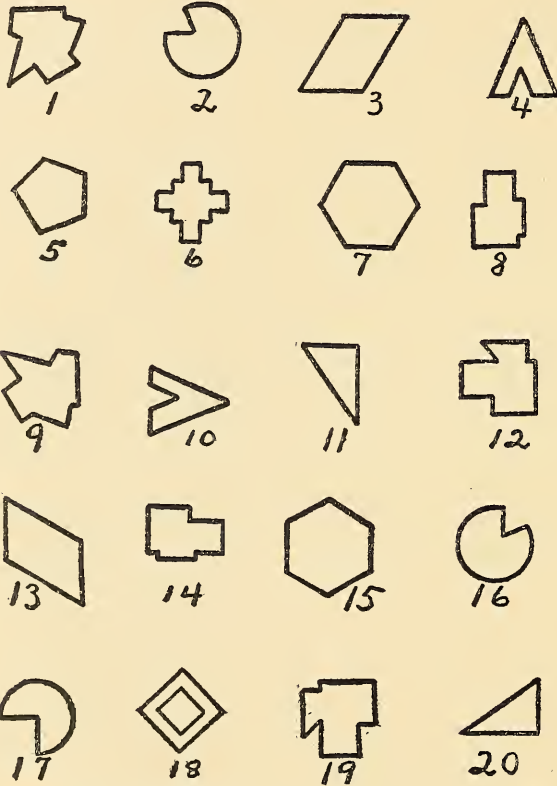
Figures are *similar* when they are exactly alike in shape. Find pairs of similar figures and write in parentheses the numbers representing each pair. E.g., (21, 53).



(Reduced to  $\frac{2}{3}$  of original size).

## TEST 18

Figures are *congruent* when they are exactly alike in shape and size. Find pairs of congruent figures and write in parentheses the numbers representing each pair. E.g., (21, 53).



(Reduced to  $\frac{2}{3}$  of original size).



## TEST 19

*Velocity* means rate of motion.

Make a check (✓) by five of the following sentences that express velocity.

1. The bullet flew from the gun to the target.
2. The bird flew faster and faster every minute.
3. The lightning leaped from cloud to cloud.
4. The train was running twenty miles an hour.
5. The train gradually came to a standstill.
6. Sound moves 1096 feet a second.
7. The normal heart beats seventy-two times a minute.
8. The earth revolves once every twenty-four hours.
9. Fear increased the boy's speed.
10. He ran more rapidly every second.
11. The horse paces a mile in less than two minutes.
12. The farther he went, the more slowly he walked.

## TEST 20

*Acceleration* means change of rate of motion.

Make a check (✓) by five of the following sentences that express acceleration.

1. The bullet flew from the gun to the target.
2. The bird flew faster and faster every minute.
3. The lightning leaped from cloud to cloud.
4. The train was going twenty miles an hour.
5. The train gradually came to a standstill.
6. Sound moves 1096 feet a second.
7. The normal heart beats seventy-two times a minute.
8. The earth revolves once every twenty-four hours.
9. Fear increased the boy's speed.
10. He ran more rapidly every second.
11. The horse paces a mile in less than two minutes.
12. The farther he went, the more slowly he walked.

## TEST 21

*Wealth* has been defined as everything, except man's own thoughts and acts, that has the power of satisfying human wants and that also can be sold.

Make a check (✓) by eight of the following which, according to this definition, represent wealth.

- |                      |                                  |
|----------------------|----------------------------------|
| 1. A hat             | 9. The Panama Canal              |
| 2. A toothache       | 10. Sweeping a floor             |
| 3. Religion          | 11. Sunshine                     |
| 4. Electricity       | 12. Freedom                      |
| 5. Poison            | 13. Cultivating a crop of cotton |
| 6. An ounce of gold  | 14. A mosquito                   |
| 7. A barrel of flour | 15. A woman's hair               |
| 8. A smile           | 16. A blush                      |

### TEST 22

*Money* has been defined as stamped metal that serves as a common medium of exchange and measure of value.

Make a check (✓) by eight of the following which, according to this definition, represent money.

- |  |  |
|--|--|
| 1. A bank note                         | 9. A nickel                            |
| 2. An ounce of silver                  | 10. A United States treasury note      |
| 3. A dime                              | 11. Gold dust                          |
| 4. A Pompeian coin                     | 12. A gold two and a half dollar piece |
| 5. A dollar                            | 13. A gold medal                       |
| 6. A gold twenty-dollar piece          | 14. A bank draft                       |
| 7. Rockefeller's check for ten dollars | 15. A quarter                          |
| 8. A penny                             | 16. A half-dollar                      |

### TEST 23

A *transitive verb* is a verb that expresses an act which passes over from the actor and affects that which is named by the object.

Make a check (✓) by each of the following sentences which, according to this definition, contains a transitive verb.

1. The boy cracked the plate.
2. The elephant lifted his master.
3. The doctor made a mistake.
4. He walked home yesterday.
5. He seems a perfect gentleman.
6. The task was finished before noon.
7. The baby hurt himself.

8. He passed the church on his way to school.
9. The merchant owed his creditors a thousand dollars.
10. She heard a noise.
11. She tore the paper.
12. The rat smelled some cheese.

## TEST 24

A *phrase* is a group of words not containing a subject and predicate and used like an adjective or an adverb.

Make a check (✓) by each sentence which, according to this definition, contains between the marks of parentheses a phrase and nothing besides the phrase and its modifiers.

1. A man (in the road) scared the horse.
2. She sat (on the porch and rocked).
3. He shifted uneasily (from side to side).
4. (Both boys and girls) attend our school.
5. The man (of whom I spoke yesterday) came today.
6. She (may have finished) her work.
7. She sang (of the days that are now passed away).
8. She likes (either singing or dancing).
9. I said, ("That is not true.")
10. "That statement," (he replied,) "is correct."
11. (According to my count,) that is the wrong number.
12. He was fishing (in the river).

*Group IV.*

Numbers 25-26 were to test the ability to make a rule. That the children might take the first step—see the likeness in each group—similar words were placed in each column. The desired rules would, in substance, read as follows: Test 25. "A vowel at the end of a monosyllabic word is retained before a suffix beginning with a consonant, and dropped before a suffix beginning with a vowel." Test 26. "Before a suffix words of one syllable retain a final -y; words of more than one syllable drop a final -y." The children were told that the rule might be true of no other words than those given in the test.

## TEST 25

What rule for spelling can you make that will apply to the following derivative words?

paleness	movable
excitement	hating
ninety	tamable
fivefold	blaming
lovely	servant
improvement	negress

## TEST 26

What rule for spelling can you make that will apply to the following derivative words?

shyness	pitiful
dryer	iciest
crying	beautifier
slyest	merciless
spryness	modifier
buying	multiplied

*Group V.*

Numbers 27-30 were to test the ability to judge reasons.

## TEST 27

The following reasons have been given why New York has become a larger city than Boston. As quickly as you can, place a cross like this, +, before each reason that you think a good one:

1. New York is on an island.
2. More foreigners live in New York than in Boston.
3. New York is on a large river coming from a rich agricultural region.
4. Mr. Rockefeller has a fine home in New York.
5. New York has more churches than Boston.
6. New York has better communication with the States lying to the west.
7. New York has elevated railroads.
8. New York is in the midst of a rich fruit and agricultural district.
9. New York is nine or ten years older than Boston.
10. New York has a Republican governor.

## TEST 28

These reasons have been given to show that oak wood is better than pine for making furniture. Check the good reasons.

1. Oak wood is harder than pine.
2. Oak trees have acorns; pine trees do not.
3. Oak wood takes a finer polish than pine.
4. Oak trees have more beautiful leaves.
5. Oak trees make good homes for squirrels.
6. Pine wood will not last so long as oak.
7. Pine is more easily dented and defaced than oak.
8. When polished and varnished, oak is much more beautiful than pine.
9. Pine trees are sometimes used for Christmas trees.
10. Oak trees are easier to climb than pine trees.

## TEST 29

The following reasons have been given to show why oranges grow better in Florida than in New Jersey. Check the good reasons.

1. There are in Florida many negroes who work very cheaply.
2. Florida has warm summer weather almost the whole year.
3. There are no alligators in New Jersey.
4. Florida very rarely has hard frosts.
5. New Jersey is not so large as Florida.
6. Florida was settled earlier than New Jersey.
7. New Jersey grows many fine peaches.
8. Florida has a very moist, warm climate.
9. Florida is a word meaning the land of flowers.
10. Florida is a popular winter resort.

## TEST 30

Among these reasons why horses are better than cattle for driving and working animals, check those which you think are good reasons.

1. Horses are more intelligent than cattle.
2. Cattle are not so tall as horses.
3. Horses like corn, oats, and hay.
4. Horses are much more active and walk faster than cattle.
5. Cattle are extensively used for food.

6. Horses are much more graceful and beautiful than cattle.
7. The skins of horses are sometimes made into gloves.
8. Horses are more easily trained and controlled than cattle.
9. President Roosevelt likes to ride on horseback.
10. Horses have more rapid and varied gaits than cattle.

### Group VI.

Numbers 31-32 were to test the ability of children to select from unorganized data all necessary facts and to use only those in reaching a conclusion. The fourth problem in number 31 was, unfortunately, so worded that it was answered usually by a mere affirmative or negative, neither of which furnished conclusive information. The third problem in number 32 became with the children a matter of simple arithmetic; they were too little sophisticated to ever complicate the problem by introducing the slope. For these reasons both problems had to be discarded.

#### TEST 31

Give answers to all of the following questions that you can. If in any case you find it impossible to give a definite answer, state why.

1. In the following sentence should one say *remains* or *remain*?—  
“The hunter is chasing the deer that 

remains
remain

 in the park.”
2. A pole driven three feet into the bottom of a pond projects four feet above the surface of the water. How long is the pole?
3. If one-half of the ceiling is painted blue, half the remaining surface red, and the remainder white, how can I find the area of the ceiling if I know the length, height, and width of the room?
4. A wealthy man in a small town refused to join his neighbors in subscribing money for the support of a great public good. Do you think his neighbors right in condemning him for this?

#### TEST 32

Give answers to all of the following questions that you can. If in any case you find it impossible to give a definite answer, state why.

1. *Faculty* means an organized body of teachers giving instruction in an institution of higher learning. Should we say “The faculty is . . . . .” or “The faculty *are* . . . . .”?



2. A vine grows a certain number of inches in four days—one hot, one cold, one rainy, and one clear. How can you find the growth for each day?

3. A man has a yard thirty feet wide. He sets it off from the street by a fence built of pickets three inches wide, placed three inches apart. The street slopes so that one end of the fence is three feet lower than the other. How many pickets does he use in the fence?

4. Dr. Jones intentionally cut Mr. Smith with a knife, so that for three weeks Mr. Smith was unable to work. During much of this time Mr. Smith suffered considerable pain. His wages were twenty dollars a week. What damages, if any, do you think should be assessed against Dr. Jones in Mr. Smith's favor?

### Group VII.

Numbers 33-36, as devised by Bonser, were to test the reasoning ability of children in arithmetic. Owing to a misprint in Bonser's monograph, the first problem in number 35 was made too difficult and hence it was discarded in making up the returns of this experiment.

#### TEST 33

Get the answers to these problems as quickly as you can.

1. If  $\frac{3}{4}$  of a gallon of oil costs 9 cents, what will 7 gallons cost?
2. John sold 4 sheep for \$5 each. He kept  $\frac{1}{2}$  of the money and with the other  $\frac{1}{2}$  he bought lambs at \$2 each. How many did he buy?
3. A pint of water weighs a pound. What does a gallon weigh?
4. At  $12\frac{1}{2}$  cents each, how much more will 6 tablets cost than 10 pens at 5 cents each?
5. At 15 cents a yard, how much will 7 feet of cloth cost?

#### TEST 34

Get the answers to these problems as quickly as you can.

1. A man whose salary is \$20 a week spends \$14 a week. In how many weeks can he save \$300?
2. How many pencils can you buy for 50 cents at the rate of 2 for 5 cents?
3. A man bought land for \$100. He sold it for \$120, gaining \$5 an acre. How many acres were there?
4. A man spent  $\frac{2}{3}$  of his money and had \$8 left. How much had he at first?
5. The uniforms for a baseball nine cost \$2.50 each. The shoes cost \$2 a pair. What was the total cost of uniforms and shoes for the nine?

## TEST 35

Get the answers to these problems as quickly as you can.

1. 132 plus what number equals 36?
2. If John had 15 cents more than he spent today he would have 40 cents. How much did he spend today?
3. What number minus 7 equals 23?
4. If James had 4 times as much money as George, he would have \$16. How much money has George?
5. What number added to 16 gives a number 4 less than 27?

## TEST 36

Get the answers to these problems as quickly as you can.

1. What number subtracted 12 times from 30 will leave a remainder of 6?
2. If a train travels half a mile in a minute, what is its rate per hour?
3. What number minus 16 equals 20?
4. What number doubled equals 2 times 3?
5. If 7 multiplied by some number equals 63, what is the number?

*Group VIII.*

Numbers 37-40 were to test the ability to reason syllogistically. The fourth syllogism in number 40 had to be discarded as the children, because of their ignorance of prime numbers, could not discover the fallacy in the argument.

## TEST 37

Some of these arguments are faulty. Find each one that is unsound and in the blank space below it briefly tell why.

1. I am not able to buy a canoe nor can I be so mean as to steal one. Consequently I am sure I shall never have a canoe.
2. Birds can sing. I am larger and wiser than any bird; therefore I can sing.
3. All Belgians speak French. Some linguists do not speak French. Therefore some linguists are not Belgians.
4. It is admitted that if a man is stingy he will refuse to give money for charity. As Mr. Jones does not give money for charity, he is certainly stingy.



## TEST 38

Some of these arguments are faulty. Find each one that is unsound and in the blank space below it briefly tell why.

1. As no scholar would make such a mistake, every man who says that is no scholar.
2. If John is president, William is secretary. But John is not president. Therefore William is not secretary.
3. Mr. Jones says that potatoes should be planted in "the dark of the moon," for only those of his potatoes planted then have produced good crops.
4. Many great men have been wretched penmen. As I am a wretched penman, it is probable that I shall be a great man.

## TEST 39

Some of these arguments are faulty. Find each one that is unsound and in the blank space below it briefly tell why.

1. The pupils of our school are boys and girls. The masked group that you saw are pupils of our school; therefore they were boys and girls.
2. I have never seen a purple cow, nor have I ever heard of one. Therefore there is no purple cow.
3. The flowers of the field do not toil, yet how beautiful they are. I should like to be beautiful. Therefore I will not toil.
4. Mr. Smith is either a Democrat or a Republican. But Mr. Smith is not a Democrat. Therefore he is a Republican.

## TEST 40

Some of these arguments are faulty. Find each one that is unsound and in the blank space below it briefly tell why.

1. Mary, who is five feet tall, looks charming in a blue dress. Therefore Edna, who is also five feet tall, will also look charming in a blue dress.
2. This statement is either true or false. It can not be true; therefore it is false.
3. If John is president, William is secretary. But William is not secretary. Therefore John is not president.
4. I plus any power of 4 equals a prime number, for I have raised four to its first fifteen powers, adding one each time, and found that each sum is a prime number.

*Group IX.*

Numbers 41-42 were to test the ability to detect catches.

## TEST 41

In each of the following sentences there is a "catch." Tell where the nonsense in each case is.

1. An unfortunate bicycle rider broke his head and died instantly; he was picked up and carried to a hospital, but they do not think he will recover.
2. On the lawn of a clever inventor is a cast iron dog that opens its mouth every time it sees an automobile pass.
3. We met a man who was finely dressed; he was walking along the street with his hands in his pockets and twirling his cane.
4. The engineer said that the more cars he had on his train the faster he could go up the hill.
5. The other day I was walking to Boston when I met a fine team of horses drawing a wagon: there were two men on the front seat, and a man, a woman, and a baby on the back seat; so five people were going to Boston.

## TEST 42

In each of the following sentences there is a "catch." Tell where the nonsense in each case is.

1. John is taller than I am; Henry is taller than John; and I am taller than Henry.
2. I have three brothers: Paul, Ernest, and myself.
3. Among the ruins of Pompeii was found a coin bearing the inscription 156 B. C.
4. A beggar died leaving an only sister; yet that sister never had a brother.
5. A soldier who had lost a foot and the lower half of one arm once when drunk wished to show his courage; so he grasped a sword and cut off his hand.

*Group X.*

Numbers 43-46 were to test the ability to make prompt and accurate associations; numbers 47-49, to follow directions. These were given as check tests, as it was maintained by some that the abilities involved would be affected more by general development than by any special study.

## TEST 43

To the right of each of the words in the following list write a word that means exactly the opposite.

long	lost
soft	wet
white	high
far	dirty
up	east
smooth	day
early	yes
dead	wrong
hot	empty
asleep	top

## TEST 44

To the right of each of the words in the following list write a word that means exactly the opposite.

north	rich
sour	dark
out	front
weak	love
good	tall
after	open
above	summer
sick	new
slow	come
large	male

(By means of the Practice Sheet it was explained to the children that in Tests 45 and 46 they were to make to the words in the single column the same kind of reaction that is indicated in the double column.)

## TEST 45

Eye—see	Ear—
Monday—Tuesday	April—
Do—did	See—
Bird—sings	Dog—
Hour—minute	Minute—
Straw—hat	Leather—
Cloud—rain	Sun—
Hammer—tool	Dictionary—
Uncle—aunt	Brother—
Dog—puppy	Cat—
Little—less	Much—
Wash—face	Sweep—
House—room	Book—
Sky—blue	Grass—
Swim—water	Fly—
Once—one	Twice—
Cat—fur	Bird—
Pan—tin	Table—
Buy—sell	Come—
Oyster—shell	Banana—

## TEST 46

Good—bad	Long—
Eagle—bird	Shark—
Eat—bread	Drink—
Fruit—orange	Vegetable—
Sit—chair	Sleep—
Double—two	Triple—
England—London	France—
Chew—teeth	Smell—
Pen—write	Knife—
Water—wet	Fire—
He—him	She—
Boat—water	Train—
Crawl—snake	Swim—
Horse—colt	Cow—
Nose—face	Toe—
Bad—worse	Good—
Hungry—food	Thirsty—
Hat—head	Glove—
Ship—captain	Army—
Man—woman	Boy—

## TEST 47

Cross out the smallest dot:    ♦   ●   ●

Put a comma between these two letters: G H


How many ears has a cat?

Make a line across this line:    |


Show by a cross which costs more: a hat or an orange.

Write 8 at the thinnest part of this line:    —————

Write any word of three letters.


Put a dot in one of the white squares:    

Cross out the word you know best: fish, brot, matzig.

Leave this just as it is:    


Mark the line that looks most like a hill:    

How many t's are there in twist?


Dot the line that has no dot over it:    

Write o after the largest number: 3 86 12

Mark the name of a large city: London, painter.

Make a letter Z out of this:    

Join these two lines:    ——— ———

Write s in the middle square:    

Write any number smaller than 10.

Put a question mark after this sentence

## TEST 48

Cross out the *g* in *tiger*.

Write 2 between the two dots:    •   •   —




How many feet make a yard?

Write + over the longest word: It rained yesterday.




Put a dot below this line:       —————

Write the sum of these numbers:  $\frac{3}{4}$



Make a boy's name by adding one letter to Joh


Make a cross in the circle:          

What comes next after D in the alphabet?

Write 7 in the largest square:          


Cross out the blackest letter in TEXAS

Write *g* on the egg-shaped figure:          


Make two dots between these lines:    

Put the sign = where it belongs: 3 + 2   5.

Write here.....the middle letter of *get*.

Put a nose on this face:    

Add a cross and make these rows equal:     $\begin{array}{ccc} \times & \times & \times \\ \times & \times & \times \end{array}$

Put a dot in the circle, below the center:    

Draw a line around the three dots:    •   •   •   •   •   •

Cross out the last word in this sentence.



## TEST 49

With your pencil make a dot over any one of these letters **F G H I J**, and a comma after the longest of these three words: **boy mother girl**. Then, if Christmas comes in March, make a cross right here.... but if not, pass along to the next question, and tell where the sun rises..... If you believe that Edison discovered America, cross out what you just wrote, but if it was some one else, put in a number to complete this sentence: "A horse has.....feet." Write *yes*, no matter whether China is in Africa or not .....; and then give a wrong answer to this question: "How many days are there in the week?"..... Write any letter except *g* just after this comma, and then write *no* if 2 times 5 are 10..... Now, if Tuesday comes after Monday, make two crosses here.....; but if not, make a circle here.....or else a square here..... Be sure to make three crosses between these two names of boys: George.....Henry. Notice these two numbers: 3, 5. If iron is heavier than water, write the larger number here....., but if iron is lighter write the smaller number here..... Show by a cross when the nights are longer: in summer?.... in winter?.... Give the correct answer to this question: "Does water run uphill?"..... and repeat your answer here..... Do nothing here ( $5 + 7 =$  .....), unless you skipped the preceding question; but write the first letter of your first name and the last letter of your last name at the ends of this line:

*Group XI.*

Numbers 50-53 were to test the ability of the children to correct errors and point off sentences. Although these matters were outside the primary interests of this study, they were too closely related to be omitted. In the schools to be reported in Part IV, the results of these tests are more important than in the Horace Mann School, where during the formal grammar periods no language work was attempted.

## TEST 50

Mark out the incorrect word in each sentence.

1. You  $\left\{ \begin{array}{l} \text{was} \\ \text{were} \end{array} \right\}$  no doubt right.
2. He had  $\left\{ \begin{array}{l} \text{laid} \\ \text{lain} \end{array} \right\}$  himself on the bed.
3. There  $\left\{ \begin{array}{l} \text{is} \\ \text{are} \end{array} \right\}$  a few of my friends who have made the trip.
4.  $\left\{ \begin{array}{l} \text{Who} \\ \text{Whom} \end{array} \right\}$  did you say called?
5. He is stronger than  $\left\{ \begin{array}{l} \text{I} \\ \text{me} \end{array} \right\}$ .
6. I said that it was  $\left\{ \begin{array}{l} \text{he} \\ \text{him} \end{array} \right\}$ .
7. Each of the boys  $\left\{ \begin{array}{l} \text{was} \\ \text{were} \end{array} \right\}$  eager to go.
8. Nero was one of the worst kings that  $\left\{ \begin{array}{l} \text{has} \\ \text{have} \end{array} \right\}$  ever ruled over Rome.

9. After he had  $\left\{ \begin{array}{l} \text{set} \\ \text{sat} \end{array} \right\}$  awhile, he left.
10. He  $\left\{ \begin{array}{l} \text{don't} \\ \text{doesn't} \end{array} \right\}$  seem to know.
11. Not one of our friends  $\left\{ \begin{array}{l} \text{was} \\ \text{were} \end{array} \right\}$  present.
12.  $\left\{ \begin{array}{l} \text{Who} \\ \text{Whom} \end{array} \right\}$  are you talking about?
13. I knew it to be  $\left\{ \begin{array}{l} \text{he} \\ \text{him} \end{array} \right\}$ .
14. Everybody was sure that  $\left\{ \begin{array}{l} \text{his} \\ \text{their} \end{array} \right\}$  lessons had been good.
15. One hundred dollars  $\left\{ \begin{array}{l} \text{is} \\ \text{are} \end{array} \right\}$  enough to pay for the boat.
16. The news  $\left\{ \begin{array}{l} \text{is} \\ \text{are} \end{array} \right\}$  gathered by reporters.

## TEST 51

Make a check (✓) before five of the following sentences that contain no language error.

1. He couldn't hardly wait.
2. I feel good after a cold bath.
3. He ain't ready yet.
4. I am fairly well today.
5. She was real pretty, I thought.
6. He hadn't ought to do that.

7. I have got a deep cold.
8. He talks too loud.
9. He stepped off of the track.
10. He got out of town at once.
11. Page ten is all the farther that I read.
12. He seen his error.
13. He hurt hisself.
14. Between you, who were born lucky, and I, who was born rich, there is little difference.
15. It is a long ways to Alaska.
16. It will all come right in the end, I am sure.

## TEST 52

Correct eight language errors in this passage.

At first the faculty of the college was by no means of one opinion regarding the boys guilt. Sentiment was turned against the young men, however, by the attitude of Johnson when called before the president.

"Who do you think stole them apples? Me?" he exclaimed angrily. "Lewis and myself would not do that kind of a thing."

After that, the tide turned against the boys. Regretting that it was necessary, it was decided by the faculty that Johnson and Lewis be suspended for a month. The sentence seemed severe; but the students, knowing more of the facts than had been laid before the president, acknowledged it to have been just.

## TEST 53

Insert capital letters and the proper punctuation marks so as to indicate the sentences in the following passages.

## I.

What a cozy little room this is the moment I opened the door I fell in love with the place do you see the great open fireplace at the end of the room it will hold a four-foot log on the panel above it you see the motto of good cheer on each side is a many-paned window and a glimpse of the garden the windows just now are framed in brilliant red leaves of woodbine is there anything so homelike as books and a fire here are all kinds of books ranged in cases on each side of the room what treasures for a rainy day now I will pull out a chair before the fire and snuggle down in luxury with a story book.

## II.

The squire was strong and tall, being over six feet in his stockings, he was fair, with a broad face, roughened and reddened by his travels, which had carried him no one knows how far, among the neighbors

the squire was held in high esteem, for no one else had been so far or could spin such yarns as he, his position in the county being that of a petty king, he spent his days, as he had a perfect right to do, in riding about and giving advice, and his nights, as he should not have done, in drinking deeply and gambling with a few chosen cronies.

*Group XII.*

Number 54 was to test the knowledge of formal grammar after the training period.

TEST 54 (for the Horace Mann School)

In the cities *there* are many things *to do*, but it is unfortunate that some of them cost many dollars more than people who are not rich are able *to afford*. This makes a few of these people *unhappy*; but if they were given fortunes, they might still think themselves ill-treated.

1. From these sentences select and write

- a) an adjective clause,
- b) an adverb clause. (Grade, 20)

2. Tell the construction (syntax, use) of the following words:

- a) there
- b) to do
- c) to afford
- d) unhappy (Grade, 40)

3. Test this sentence for a predicate attribute of the object (objective complement) by the following definition: "A predicate attribute of the object represents the effect of the act expressed in the predicate on that which the object represents."—"The carpenter planed the pine board smooth." (Grade, 30)

4. Tell why the second group of words is (or is not) a sentence: "Last summer there was a circus in the town where I visited. *The procession passing down the street by my grandmother's home.*" (Grade, 10)

TEST 54 (for the other schools)

In the cities *there* are many things *to do*, but *it* is unfortunate that some of them cost many *dollars* more *than* people *who* are not rich are able *to afford*. This makes a few of these people *unhappy*; but if they were given *fortunes*, they might still think themselves ill-treated.

1. If either of these sentences is compound, write here the conjunction that joins the two members. (Grade, 10)

2. From these sentences select and write

a) an adjective clause,

b) an adverb clause,

c) a noun clause. (Grade, 10 each.)

3. Parse the verb phrase *were given*. (Grade, 10)

4. Tell the construction (syntax, use) of the following words:

a) there

f) than

b) to do

g) who

c) it

h) to afford

d) that

i) unhappy

e) dollars

j) fortunes. (Grade, 5 each.)

### Scoring

An attempt was made to have the tests that were administered in January equal in difficulty to the corresponding ones that were administered at the beginning of the school year and again in April. But inasmuch as it is all but impossible to foresee details that will cause difficulties peculiar to the child mind, it was necessary to equalize the tests somewhat by the method of scoring employed. Through the courtesy of Superintendent E. C. Broome and of Professor F. G. Bonser, a number of the tests were given in the seventh and eighth grades at Mt. Vernon, New York, and at the Speyer School, in order to ascertain their relative difficulty. Largely on the basis of the information thus obtained the scoring was adjusted so as to secure results easily comparable. Inasmuch as the gain or loss of one group of children is significant only when compared with that of the other, the changes in any score did not affect the truth that it expressed.

(All scores are expressed as averages.)

### Tests 1-6

8 correctly checked = 10

7 or 9 correctly checked = 4

6 correctly checked = 2

(For comparison, the score of Test 1 is multiplied by 2.)

*Tests 7-8*

Likeness in a common letter = .5

(with a maximum of  $2 \times .5$ )

Any other common element = 1

Each error = -.5

(For comparison, the score of Test 8 is multiplied by 2.)

*Tests 9-10*

Each correct answer = 1

(For comparison, the score of Test 9 is multiplied by 7.)

*Tests 11-12*

	a					b					c				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Test 11.....	-2,	-4,	7,	2,	-5;	2,	-4,	7,	-2,	-3;	7,	-3,	-3,	-3,	3.
Test 12.....	-2,	7,	1,	-7,	2;	1,	1,	-4,	7,	-3;	-7,	2,	7,	-3,	-4.

Unattempted = -10

(For comparison, the score of Test 12 is multiplied by 5/4.)

*Tests 13-14*

Each definition correctly changed = 2

(The correct definition in each test was not counted a score unless it was in some way approved.)

*Tests 15-16*

Each figure correctly marked = 2

Each figure incorrectly marked = -2

Unattempted = -8

(For comparison, the score of Test 16 is multiplied by 2.)

*Tests 17-18*

Each pair correctly made = 1

Error in star figures = -1

Each other error = -2

Unattempted or meaningless = -8



*Tests 19-22*

Each correct check = 1

Each error = -1

Unattempted = -8

(For comparison, the score of Test 21 was multiplied by 3.)

*Test 23*

Each correct check = 1

Each check of numbers 4, 5, 6 = -2

Any other incorrect check = -1

Unattempted = -6

*Test 24*

Each correct check = 1

Each check of numbers 2, 4, 8, 9, 10 = -2

Any other incorrect check = -1

Unattempted = -6

*Tests 25-26*

Each correct rule = 1

*Tests 27-30*

	1	2	3	4	5	6	7	8	9	10
Test 27	-2,	1,	3,	-3,	-2,	3,	-1,	3,	1,	-3.
Test 28	2,	-3,	3,	-3,	-3,	2,	3,	3,	-3,	-3.
Test 29	-1,	3,	-3,	3,	-3,	-3,	-2,	3,	-3,	-3.
Test 30	3,	-2,	-3,	3,	-2,	2,	-3,	3,	-3,	2.
	Unattempted = -6									

(These scores are the medians of scores attributed by five trained psychologists and four graduate students. For comparison, the score of Test 27 was multiplied by 1.6.)

*Tests 31-32*

Each correct answer = 1

(For reasons already given number 4 in 31 and number 3 in 32 were discarded. The total score is then divided by 3.)

*Tests 33-36*

Each correct answer = 1

(Owing to a misprint in Bonser's report, 32 in the first example of Test 35 became 132, thus causing more difficulty than was intended. Hence this example was discarded. The total score is then divided by the number of examples in each test.)

*Tests 37-40*

Each fallacy explained = 1

(The sound syllogism is scored in each test if it is left blank, providing the others are attempted. Owing to the ignorance by many children of prime numbers, number 4 of Test 40 was discarded and all scores are reported on the basis of single syllogisms. For comparison, the score of Test 38 is multiplied by 1.6.)

*Test 41*

Minor catch detected in number 2 = .5

Each other catch detected = 1

*Test 42*

Each catch detected in numbers 1, 2, 5 = 1

Each catch detected in numbers 3, 4 = 2

(For comparison, the score is multiplied by 1.25.)

*Tests 43-44*

Each opposite correctly given = 1

Each error = — 1

*Tests 45-46*

Each correct reaction = 1

Each minor error = —.5

Each other error = — 1

*Tests 47-49*

Each correct reaction = 1

*Test 50*

Each sentence corrected = 1

Each error = -1

(The score is reported as the total score divided by the number attempted.)

*Test 51*

Each correct check = 1

Each incorrect check = -2

*Test 52*

Each correct change = 2

Each incorrect change = -2

Each error checked but not corrected = 1

*Test 53 I.*

Each terminal punctuation = 1

Each ? or ! = additional 1

Each capital letter = 1

Each error = -2

Unattempted = -8

*Test 53 II.*

Each terminal punctuation = 1

Each ? or ! = additional 1

Each capital letter = 1

Each error = -2

Unattempted = -4

## PART III

### CONDITIONS SECURED AT THE HORACE MANN SCHOOL

Through the courtesy of Principal Henry Carr Pearson, conditions as nearly ideal as could be expected for such an extended experiment were provided in the Horace Mann Elementary School. Two seventh grades, consisting of the children of well-to-do parents and of members of the university family, were put at the disposal of the experimenter for three thirty-minute periods a week during six months. During this time the number of children in each grade varied from twenty-five to thirty. So far as could be ascertained, there had been an absolutely chance division of the children: most of those in each room had been in the school during a term of years, about an equal number in each room had had kindergarten training, they were about equally divided as to sex, etc.

#### *The Children and School Conditions*

But inasmuch as the numbers were too small for dependence to be put in the fairness of the division by chance, an attempt was made to determine the relative abilities of the children. At the end of the year the teacher in charge of each room, the special teacher of arithmetic (who also was in charge of Room II), the special teacher of history, and the teachers who had had nearly all the children in the sixth grade during the preceding year were asked to rank them in five classes according to their general intellectual ability. Following are the results:

TABLE I

SHOWING THE RANKINGS OF THE CHILDREN IN GENERAL INTELLECTUAL ABILITY BY THE TEACHER OF GEOGRAPHY.

Rank	Number in Room I.		Weight			Number in Room II.		Weight		
1	4	x	5	=	20	6	x	5	=	30
2	7	x	4	=	28	9	x	4	=	36
3	11	x	3	=	33	8	x	3	=	24
4	5	x	2	=	10	3	x	2	=	6
5	2	x	1	=	2	3	x	1	=	3
					—					—
					93					99

TABLE II

SHOWING THE RANKINGS OF THE CHILDREN IN GENERAL INTELLECTUAL ABILITY BY THE TEACHER OF HISTORY.

Rank	Number in Room I.		Weight			Number in Room II.		Weight		
1	4	x	5	=	20	8	x	5	=	40
2	7	x	4	=	28	7	x	4	=	28
3	9	x	3	=	27	9	x	3	=	27
4	7	x	2	=	14	3	x	2	=	6
5	2	x	1	=	2	2	x	1	=	2
					—					—
					91					103

Between the rankings of these two teachers there is, as measured by the Spearman Footrule Method, a positive correlation of .79.

Tabulating and weighting the rankings by the four teachers, the rankings of the other two teachers not being presented here in detail, we have:

TABLE III

Rank	Number in Room I.		Weight			Number in Room II.		Weight		
1	20	x	5	=	100	25	x	5	=	125
2	27	x	4	=	108	31	x	4	=	124
3	37	x	3	=	111	30	x	3	=	90
4	22	x	2	=	44	13	x	2	=	26
5	5	x	1	=	5	12	x	1	=	12
					—					—
					368					377

These three tables seem to show that in the judgments of the teachers who best knew the children the two groups as wholes varied very little in their natural intellectual ability. So far as these three tables are indicative, however, the children of Room II were slightly superior.

The personal equation of the teachers necessarily influences such rankings; consequently the children were compared also on the basis of their reactions on October first to the standardized tests, numbers 44, 46, 47, and 48, which are, perhaps, as good tests of general intellectual power as have been devised. It was found that when the scorings were divided into five ranks and each rank was weighted, the following comparison resulted.

TABLE IV

*Test 44*

<i>Room I.</i>		<i>Room II.</i>	
0 x 5 =	0	2 x 5 =	10
3 x 4 =	12	2 x 4 =	8
9 x 3 =	27	8 x 3 =	24
9 x 2 =	18	6 x 2 =	12
2 x 1 =	2	6 x 1 =	6
<hr/>		<hr/>	
23	59	24	60
	<hr/>		<hr/>
Av.	2.57		2.50

*Test 46*

<i>Room I.</i>		<i>Room II.</i>	
4 x 5 =	20	5 x 5 =	25
5 x 4 =	20	8 x 4 =	32
8 x 3 =	24	4 x 3 =	12
6 x 2 =	12	5 x 2 =	10
0 x 1 =	0	2 x 1 =	2
<hr/>		<hr/>	
23	76	24	81
	<hr/>		<hr/>
Av.	3.30		3.38



## Test 47

Room I.				Room II.			
3	x	5	= 15	2	x	5	= 10
5	x	4	= 20	11	x	4	= 44
11	x	3	= 33	7	x	3	= 21
4	x	2	= 8	3	x	2	= 6
0	x	1	= 0	1	x	1	= 1
<hr/>				<hr/>			
23			76	24			82
<hr/>				<hr/>			
Av.			3.30				3.42

## Test 48

Room I.				Room II.			
5	x	5	= 25	3	x	5	= 15
5	x	4	= 20	6	x	4	= 24
2	x	3	= 6	4	x	3	= 12
7	x	2	= 14	5	x	2	= 10
4	x	1	= 4	5	x	1	= 5
<hr/>				<hr/>			
23			69	23			66
<hr/>				<hr/>			
Av.			3.00				2.87

These results seem to show that Room II as a whole is slightly more variable than Room I and also that it averages somewhat higher in ability. The latter conclusion is confirmed by the results of the remaining tests given before any training. Among the seventeen in which positive scores were made by both rooms, Room II was superior in 11, equal in 1, and inferior in 5 to Room I. The differences between the scores expressed as per cents of the lower are as follows:

Room I superior by 2, 9, 18, 36, 44,—with an average of 22.

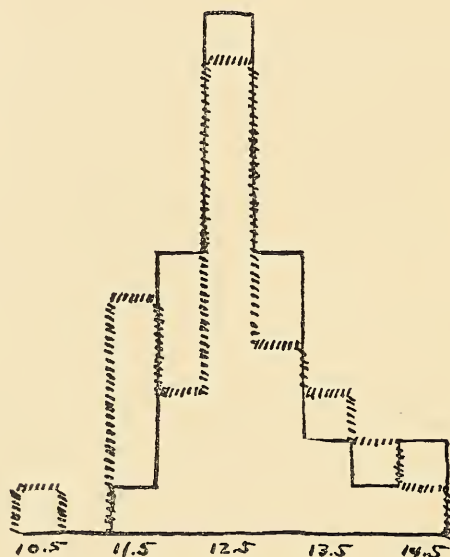
Room II superior by 10, 17, 25, 31, 33, 33, 42, 56, 57, 62, 81,—with an average of 41.

When the children are compared as to age it is seen that Room II shows a wider distribution, but the averages and medians, counted by half years, are identical. The distribution is shown in Figure I. Whatever variation exists probably is not significant, for there is a correlation (Spearman Footrule Method) between the age and intellectual ability, of the children

of Room II, of only  $+.06$ , and between age and ranking in knowledge of grammar of only  $+.19$ .

But inasmuch as chance distribution, the ranking of teachers, and the results of the tests used might be inaccurate, a double check was arranged. At the beginning of the school year 1912,

FIGURE I  
Showing Age Distribution Correct to Revised Half Year. (Oct. 1, 1913.)



Room I ———— Av.  $12\frac{3}{4}$ , Med. 12.9

Room II ||||| Av. 12.5, Med. 12.8

all of the children were given the first set of tests. Then for three months, three periods a week, the children of Room I were taught formal grammar by the experimenter, who for five years had given instruction in the subject in a state normal school; during these three months the children of Room II had work in composition and language. There were then given the second set of tests, after which the conditions were reversed: the children of Room II having formal grammar; those of Room I working

with language and composition. Then about the middle of April, 1913, the first set of tests was again given to all the children. By this arrangement, original difference in intellectual abilities mattered little. Not only could the record of Room I with formal grammar for three months be compared with that of Room II without it, and *vice versa*; but also, so far as each test is comparable with its fellow in difficulty, the record of each room with formal grammar could be compared with the record made by the same room during the three months when it was taught language and composition.

### *Other Conditions*

During the two teaching periods of three months each, as many conditions as could be controlled were alike. The rooms were practically the same in every respect; the course of study was identical for both rooms, some children in each taking French, others German, etc.; the children of both rooms had in common teachers of formal grammar, history, arithmetic, geography, German or French, music, and manual arts; the grammar in each room was taught at some period between 10:30 and 1:00, when school was dismissed for the day.

It would be better, of course, had more time been devoted to the experiment, but it could hardly have been taken without working an injustice to the children. Besides, it was believed that if there were any marked transfer of the abilities acquired through the study of formal grammar, it should be manifest after three months of intensive work.<sup>29</sup> Especially should this be true if the subject be taught, as it was, as 'an elementary part of logic, the beginning of the analysis of the thinking process.'<sup>30</sup> In each class the same material was used—the sentence and each of its essential elements; adjectives and adverbs; and phrases and clauses as modifiers. Emphasis was laid not at all on grammar in its relation to literature and composition, but

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<sup>29</sup> The course of study provides that approximately half of the three periods a week throughout the year be given to grammar.

<sup>30</sup> J. S. Mill, quoted by Leonard, *loc. cit.*

on the subject as a strict science. The children were given crude material, from which, after likenesses and differences were discovered, definitions were built up. These definitions were compared with those in standard texts and all of them criticized; and then the accepted definition was repeatedly applied, with systematic thoroughness, to examples. In fact, all of the activities of the mind which are asserted to be improved by the study of formal grammar were attempted as frequently as time would permit.

### *Attempt to Secure a General Ideal*

From time to time during the formal grammar teaching attempts were made to establish a general ideal<sup>81</sup> of the methods pursued. Attention was called to the necessity of seeing likenesses and differences, of thoroughly applying definitions, etc., in arithmetic, geography, and other matters as well as in grammar, and a small amount of practice was given in several other fields. Very little, however, seemed to be accomplished, though more effort was expended than can be reasonably expected from the class-room teacher in the ordinary routine of her work.

To those who have only theoretical ideals of the kind and amount of grammar that should be taught in the upper grades the results of the three months' work would seem pitifully small. Despite the general interest of the children in the class-room work, they learned just enough grammar to be a disappointment and source of vexation to the teachers of the high school, which they will enter in the fall of 1913. And yet their accomplishment was quite as great, judged by the results of Test 54, as that of children in typical public schools. Whatever be the truth about the amount of transfer, it is a question whether elementary school children can under ordinary conditions learn enough of formal grammar to justify its study. Owing chiefly to better teaching by the experimenter, especially in the increased amount of drill, the children of Room II showed in their grammar examination immediately after the training period better results than did those of Room I. These results are shown in Table V.

<sup>81</sup> Ruediger, *Educ. Rev.*, XXXVI, 364 ff.

TABLE V

SHOWING GRADES ON THE EXAMINATION AT THE END OF THE PERIOD OF  
FORMAL GRAMMAR TEACHING.

Boys	Room I.	Room II.
1	50	25
2	47.5	30
3	0	45
4	25	20
5	5	10
6	48	55
7	5	20
8	Absent	75
9	2.5	50
10	Absent	30
11	25	25
12	10	55
13	7.5	20
14	27.5	20
15	45	40
16		18
Girls		
1	7.5	90
2	10	50
3	28	60
4	37.5	90
5	7.5	65
6	48	50
7	17.5	75
8	17.5	5
9	20	60
10	65	25
11	5	70
12	20	55
13	50.5	65
14	50	
15	42.5	
Average	25.88	44.76

#### *Administration of the Tests*

The tests were given personally by the experimenter, who stood in a doorway that connected the two rooms. Thus the children sat in their own seats, each with a practice sheet, by



which instructions were given when it was necessary. The children were highly interested throughout all the periods, the longest of which was forty-five minutes; the others, thirty or less.

The tests were administered as follows: Individual test sheets were passed, and after the children had written their names on the backs the sheets were kept face down until instructions were given. Any necessary questions were answered, but the instructions were so carefully prepared that seldom was there any question. At a signal each child held up his pencil to signify his readiness; at "Go!" he turned over his paper and worked until he either finished or heard "Stop!" During the tests all objective conditions were the same except that the experimenter was at the back of one room and at the front of the other.

The amount of time allowed to each exercise was determined partly by the preliminary tests given at Mt. Vernon, and then changes were made as the tests proceeded in the Illinois schools.<sup>32</sup> The ideal in most cases was to allow enough time so that all who were capable or who worked steadily could finish within the time limit. In the association tests the ideal was to allow not quite enough time for anyone to get entirely through, undistributed perfect scores being almost as impossible to interpret as undistributed zeros. Careful records kept of the amount accomplished in the association tests and of the number of pupils completing the others showed that the time allowance was fair and, in most cases, not far from the ideal. It was notable that hardly any of the approximately six hundred children tested used any of the time remaining after they had "finished." Instead of verifying their results, practically all of those who finished within the time allowance merely waited for the final signal. This was true, likewise, of many who failed to secure within two or three minutes a clue to such tests as 1-6.

### *Results*

[In all of the Tables the score and gain made following the training period in formal grammar are in italics.]

*Group I.* Ability to see likenesses and differences.

Of these tests, numbers 2, 3, and 5 proved too difficult. In

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<sup>32</sup> Reported in Part IV.



number 2, when it was first given, no child scored. In number 3 only one child from Room I scored and only three from Room II; in number 5 only one child from Room I scored and none from Room II. Consequently these tests are discarded. Pairing numbers 1 and 4, we have Table VI.

TABLE VI

	<i>Test 4a*</i>	<i>Test 1</i>	<i>Gain</i>	<i>Test 1</i>	<i>Test 4b</i>	<i>Gain</i>
Room I.	3.60	4.74	1.14	4.74	8.15	3.41
Room II.	2.50	5.94	3.44	5.94	6.40	.46

Room I in the preliminary test showed a superiority over Room II in seeing likenesses. After three months of formal grammar, Room I showed only about a third as much gain in this ability as Room II, without formal grammar, showed. Room II, on the other hand, after its three months of formal grammar, showed only about an eighth as much gain as Room I, after three months without formal grammar, showed. When each room is compared with itself, Room I gained with formal grammar only about a third of what it gained without; while Room II only about an eighth as much. Thus the comparison of room with room or of each room with itself affords practically the same results, the smaller score going after the work in formal grammar in each of the four cases.

When number 2 was given the second time (in April, 1913) a normal number scored from each room. Comparing these scores with those made by the four children in number 3 (in January, 1913), we have a similar, though less trustworthy, result, as shown in Table VII.

TABLE VII

	<i>Test 3</i>	<i>Test 2a</i>	<i>Gain</i>
Room I.	.36	2.41	2.05
Room II.	.86	2.31	1.45

The gain of Room II with formal grammar is only three-fourths that of Room I without it.

\* The letter *a* is added after the number of the test when it was given in October; *b* is added when the same test was given a second time in April.

In numbers 7-8 the highest number of common elements recorded by any child was only about one-third the number recorded by all the children. Here was a field, then, in which ingenuity could—and did—find ample latitude. See Table VIII.

TABLE VIII

	<i>Test 8a</i>	<i>Test 7</i>	<i>Gain</i>	<i>Test 7</i>	<i>Test 8b</i>	<i>Gain</i>
Room I.	1.41	3.48	2.07	3.48	3.24	— .24
Room II.	2.28	3.33	1.05	3.33	5.30	1.97

Room I with formal grammar brought its score up from 62 per cent of that of Room II to a slight superiority; Room II then, with formal grammar, brought its score up from practical equality to 1.64 times that of Room I. Compared with themselves, Room I gained 2.07 during the three months with formal grammar and lost .24 during the three months without it, while Room II gained 1.05 during the period without formal grammar and 1.97 during the period with it. Here the superiority goes after formal grammar in each of the four comparisons.

Tests number 9-10 proved so difficult that no great amount of confidence can be put in the results. However, in this as in every other case conditions were equal for both rooms. Table IX shows that with formal grammar each room gained more than the other room or itself without it.

TABLE IX

	<i>Test 10a</i>	<i>Test 9</i>	<i>Gain</i>	<i>Test 9</i>	<i>Test 10b</i>	<i>Gain</i>
Room I.	1.00	1.50	.50	1.50	1.59	.09
Room II.	1.00	1.05	.05	1.05	1.44	.39

The results as shown in these tables are somewhat favorable to the room having had formal grammar, its score being superior to the other, when the untrustworthy Tables VII and IX are included, in eight out of thirteen comparisons. Excluding these tables, we find that the room with formal grammar is superior in six out of ten comparisons.

*Group II. Ability to judge a definition.*

The low scores in 12a are due partly to the fact that the children worked slowly in this first test and partly to their

obsession for the poor definitions a 1 and a 4. In April, when number 12 was given the second time, the children were advised to distribute their time equally among the three parts and signals were given at the end of 37, 71, and 105 seconds. Judged by the scores as compared with those of number 11, this device seemed to accomplish little; as a matter of fact several of the children—there may have been more—were observed working with pride ahead of the signal. The device would probably have improved the first scores, however, had it been used.

TABLE X

	<i>Test 12a</i>	<i>Test 11</i>	<i>Gain</i>	<i>Test 11</i>	<i>Test 12a</i>	<i>Gain</i>
Room I.	— .76	13.80	14.56	13.80	14.33	.55
Room II.	2.14	18.38	14.24	18.38	14.90	—3.48

In numbers 13-14 the children were asked not only to judge four definitions but also to correct those that were untrue. As it was impossible when a definition was passed over to tell whether the child considered it correct or too difficult to attempt, the fourth definition in number 13 and the second in number 14 were scored only when they were in some manner approved.

TABLE XI

	<i>Test 14a</i>	<i>Test 13</i>	<i>Gain</i>	<i>Test 13</i>	<i>Test 14b</i>	<i>Gain</i>
Room I.	.96	2.43	1.47	2.43	3.13	.70
Room II.	1.28	2.52	1.24	2.52	3.23	.71

From Table X we see that Room I with formal grammar gained about two per cent more than did Room II without it; and that when the conditions were reversed Room II actually lost 3.48 while Room I was gaining .55. Because of the great difference between the gains in the first practice period and in the second, a comparison of each room with itself is unprofitable. As it stands, however, such a comparison shows that Room I with formal grammar gained 14.01 more than it did without it, while Room II with formal grammar gained 17.72 less than it did with it.

Table XI shows the gain of Room I with formal grammar approximately nineteen per cent more than that of Room II

without it; and with the conditions reversed, gains that are practically identical. As prime numbers seem to have been learned during the year, a comparison of each room with itself reveals nothing of value. The results of the tests in this group are neutral. There is no evidence of a positive transfer after formal grammar.

*Group III.* Ability to thoroughly apply a definition.

The tests of this group especially demanded promptness as well as accuracy; in fact, it is probable that too little time was allowed for tests number 15 and 16, extreme promptness and accuracy as a result being better measured by them than accuracy alone. Judged by the number finishing the work before the signal, time enough was given to each of the other tests to secure accurate results.

TABLE XII

	<i>Test 16a</i>	<i>Test 15</i>	<i>Gain</i>	<i>Test 15</i>	<i>Test 16b</i>	<i>Gain</i>
Room I.	6.88	9.57	2.69	9.57	7.46	-2.11
Room II.	5.84	8.89	3.05	8.89	10.16	1.27

As shown in Table XII Room I with formal grammar gained .36 less than Room II without it; without formal grammar it gained 3.38 less than Room II with it. When each is compared with itself Room I gained 4.80 less without formal grammar than with it; Room II, 1.78 less with it than without it. Thus from these figures no claim can fairly be made for the disciplinary value of the subject.

TABLE XIII

	<i>Test 18a</i>	<i>Test 17</i>	<i>Gain</i>	<i>Test 17</i>	<i>Test 18b</i>	<i>Gain</i>
Room I.	5.68	5.21	-.47	5.21	7.22	2.01
Room II.	5.20	6.32	1.12	6.32	7.00	.68

In Table XIII the gain for the room with formal grammar is less in each case, by 1.57 and 1.33. Without formal grammar Room I gained 2.48 more than with it; Room II, .44 more. The evidence here is distinctly against any positive transfer.

TABLE XIV

	<i>Test 20a</i>	<i>Test 19</i>	<i>Gain</i>	<i>Test 19</i>	<i>Test 20b</i>	<i>Gain</i>
Room I.	1.08	.59	.49	.59	4.26	3.67
Room II.	1.96	-.93	-2.89	-.93	1.80	2.73

In Table XIV Room I with formal grammar gains .49 while Room II without it loses 2.89; when the conditions are reversed Room I gains 3.67; Room II, 2.73. When each is compared with itself we see that Room I gains 3.18 more without formal grammar than with it, while Room II gains 5.62 less. Here the evidence is such as would result by chance: one-half favors transfer, the other half denies it.

TABLE XV

	<i>Test 22a</i>	<i>Test 21</i>	<i>Gain</i>	<i>Test 21</i>	<i>Test 22b</i>	<i>Gain</i>
Room I.	1.72	3.14	1.42	3.14	5.84	2.70
Room II.	2.81	3.17	.36	3.17	6.41	3.24

Table XV shows that with formal grammar Room I gained 202 per cent more than Room II without it, and that Room II with formal grammar gained 20 per cent more than Room I without it. Compared with itself Room I gained 90 per cent more without formal grammar than with it, while Room II gained 547 per cent more with formal grammar than without it. Here the children did distinctly better after formal grammar.

On account of the subject-matter, Tests 23 and 24 were not given at the first testing period. The results at the second and third periods are shown in Table XVI.

TABLE XVI

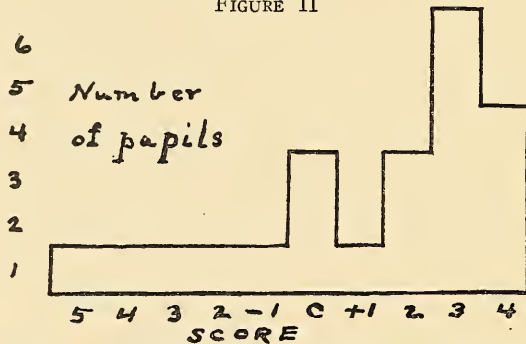
	<i>Test 23a</i>	<i>Test 23b</i>	<i>Gain</i>	<i>Test 24a</i>	<i>Test 24b</i>	<i>Gain</i>
Room I.	— .47	.81	1.28	— 2.17	— 1.24	.93
Room II.	.59	.82	.23	— 2.76	— .91	1.85

After three months of formal grammar Room I made scores of —.47 and —2.17; then after a like period without this training it raised both scores, by 1.28 and .93 respectively. Without formal grammar Room II made scores of .59 and —2.76; with it, the room raised both scores, by .23 and 1.85 respectively. The record after formal grammar is not creditable in any case, the best record for number 23 being .82 out of a possible 4.00 and for number 24 —.91 out of a possible 4.00. The evidence regarding transfer is negative; the same results might have been obtained by chance.



For fear that the two minutes given for test number 23 was too short a time for the children to thoroughly apply the definition, Room II, having just completed the work in formal grammar, was given another trial of the test. After reviewing the principles of fully analyzing a complex definition into its details and of making specific questions that would prove the application of each detail, the children used for practice work test number 21, which they had had on the preceding day. When they together had applied the definition of "wealth" and had discussed their errors of omission and of commission, they were given (for the third time) test number 23. At this trial the children were allowed all the time they wanted: many of them were through framing and applying their questions in three minutes; the last one finished in twelve minutes. The room score was 1.18 out of a possible 4. The curve in Figure II shows the distribution of the individual scores.

FIGURE II



Judging by these results no one can maintain that such training in grammar as these children had in the least improves their ability to thoroughly apply such definitions as these. Moreover, it would further appear that the demands of tests 23 and 24, which are frequent in formal grammar classes, can not be satisfactorily met by such children as these even under the most favorable conditions.

*Group IV.* Ability to make a rule or definition.

The task set by tests number 25-26 proved entirely beyond children of this age and maturity. The few rules attempted



were so incomplete and full of errors that no indicative record could be made. A record was begun of how the children set to work—whether they saw the likeness and difference between the two groups of words—but so many had set down nothing at all that this was abandoned. The only conclusion that can be drawn from this test is that children such as were tested are not brought up by this kind and amount of training in formal grammar to an ability to make the rules called for.

*Group V.* Ability to judge reasons.

The children considered the tests in this group very easy, most of them finishing well within the time allowed. The fact, however, that some individuals will see for an occasional reason a substantial justification that does not occur to others makes the conclusions less convincing than it was hoped they might be. For example, the nine adults who prepared scores for these tests, gave to the seventh reason of test number 27 ("New York has elevated railroads.") the following credits: — 1, — 1, 0, — 3, — 2, — 1, — 3, 2, 1, any one of which might in a way be justified. It may be said in defense of the tests, however, that children are less likely to introduce sophistication into the matter than are adults. This is proved by the approximation in the April tests, numbers 28 and 30, to the perfect scores 13 and 13.

TABLE XVII

	<i>Test 28a</i>	<i>Test 27</i>	<i>Gain</i>	<i>Test 27</i>	<i>Test 28b</i>	<i>Gain</i>
Room I.	5.77	8.17	2.40	8.17	11.35	3.18
Room II.	7.24	8.33	1.09	8.33	11.40	3.07

In Table XVII Room I with formal grammar is seen to have made more than twice as much gain as Room II without it, while Room II with its term of formal grammar makes a trifle less gain than Room I without it. Compared with itself, Room I makes a better gain without formal grammar; Room II, a much better gain with it.

TABLE XVIII

	<i>Test 30a</i>	<i>Test 29</i>	<i>Gain</i>	<i>Test 29</i>	<i>Test 30b</i>	<i>Gain</i>
Room I.	4.69	7.63	2.94	7.63	9.81	2.18
Room II.	6.67	8.14	1.47	8.14	10.64	2.40

In Table XVIII each room makes a better record with formal grammar than the other room makes without it, and likewise a better record than itself makes without it. So far as the evidence in these two tables is convincing, the formal grammar training manifests some transfer in six out of eight comparisons.

*Group VI. Ability to use data.*

The inability of children to select from a mass of data all that they need and no more is strikingly shown in the small scores of Table XIX. The maximum possible in each case is 1.

TABLE XIX

	<i>Test 32a</i>	<i>Test 31</i>	<i>Gain</i>	<i>Test 31</i>	<i>Test 32b</i>	<i>Gain</i>
Room I.	.06	.35	.29	.35	.12	— .23
Room II.	.08	.48	.40	.48	.19	— .29

So far as the small scores permit of a conclusion, it would seem that the room with formal grammar made a worse score, by .11 and .06, than the room without it. Compared with itself, Room I did better by .52 with formal grammar; Room II did better by .69 without it. Thus the evidence is against a positive transfer.

*Group VII. Ability to reason in arithmetic.*

As the children were not asked to give the steps by which they solved these problems, the scores measure reasoning ability and skill in computation combined.

TABLE XX

	<i>Test 34a</i>	<i>Test 33</i>	<i>Gain</i>	<i>Test 33</i>	<i>Test 34b</i>	<i>Gain</i>
Room I.	.300	.428	.128	.428	.638	.210
Room II.	.392	.550	.158	.550	.692	.142

By Table XX it is seen that with formal grammar Room I gains .128 while Room II without it gains .158; conditions being reversed, Room I gains .210, Room II, .142. It is probable, however, that the gain of Room II during the second period is more nearly equal to that of Room I than it seems, as it is from a higher base. Being .122 points above Room I in January,

Room II in April has gained enough skill to be superior by .054 points. When compared with itself, each room is seen to have gained less after formal grammar: .128 vs. .210 for Room I; .158 vs. .142 for Room II.

TABLE XXI

	<i>Test 36a</i>	<i>Test 35</i>	<i>Gain</i>	<i>Test 35</i>	<i>Test 36b</i>	<i>Gain</i>
Room I.	.231	.603	.372	.603	.684	.081
Room II.	.360	.707	.347	.707	.573	— .134

By Table XXI the evidence is exactly balanced. With formal grammar Room I gains .025 more than Room II without it; while with conditions changed Room II gains .215 less than Room I. When compared with itself, Room I is seen to have gained .291 more with than without formal grammar and Room II to have gained .481 less.

In these tables six comparisons favor the room having language and composition; only two favor the room having formal grammar.

*Group VIII. Ability to reason syllogistically.*

In this group of tests practically all the children finished well within the time allowed and, despite many fragmentary answers, apparently felt well satisfied with their attempts. It was notable that very few of the children ever went back and reviewed their work. It was unfortunate that the children were not asked specifically to indicate which syllogisms were sound, for a blank after a sound syllogism may have resulted from a feeling of inability rather than from a recognition of soundness.

TABLE XXII

	<i>Test 38a</i>	<i>Test 37</i>	<i>Gain</i>	<i>Test 37</i>	<i>Test 38b</i>	<i>Gain</i>
Room I.	1.92	2.52	.60	2.52	3.00	.48
Room II.	2.11	2.72	.61	2.72	2.75	.03

After the first practice period the room with formal grammar showed practically the same gain as the other (See Table XXII); after the second period, a gain considerably less. Compared with itself, Room I gained a little more with formal grammar than without; Room II, considerably less.

TABLE XXIII

	<i>Test 40a</i>	<i>Test 39</i>	<i>Gain</i>	<i>Test 39</i>	<i>Test 40b</i>	<i>Gain</i>
Room I.	2.22	2.50	.28	2.50	2.56	.06
Room II.	2.66	2.48	— .18	2.48	3.08	.60

Here, as shown in Table XXIII, in each case the better score is made by the room having had formal grammar, whether the comparison is made of one room with the other or of one room with itself. Judged by the first pair of tests in this group, the evidence is against any transfer; judged by the second pair of tests, the evidence is strongly for it.

*Group IX.* Ability to detect catches.

TABLE XXIV

	<i>Test 42a</i>	<i>Test 41</i>	<i>Gain</i>	<i>Test 41</i>	<i>Test 42b</i>	<i>Gain</i>
Room I.	3.13	3.28	.15	3.28	4.05	.77
Room II.	3.05	3.17	.12	3.17	3.85	.68

In Table XXIV there is almost no difference between the scores of the room with formal grammar and those of the room without it. When each room is compared with itself, one comparison favors formal grammar; the other does not. Thus there is no evidence of transfer.

*Group X.* Ability to make prompt and accurate associations and to follow directions.

The scores in the first two of the following tables will in some degree indicate what improvement may result from normal growth, practice due to taking tests, and the repetition of certain tests after an interval of six months. A comparison of these scores, which are presumably not influenced to an appreciable extent by any individual subject in the curriculum, with those resulting from tests 1-42, will show in these latter no positive change that can be due to the presence of formal grammar.

TABLE XXV

	<i>Test 44a</i>	<i>Test 43</i>	<i>Gain (Per cent)</i>	<i>Test 43</i>	<i>Test 44b</i>	<i>Gain (Per cent)</i>
Room I.	13.04	15.22	2.18 (17%)	15.22	17.00	1.78 (12%)
Room II.	13.29	16.15	2.86 (22%)	16.15	16.85	.70 (4%)

It will be noted that the initial scores differ by only .25 points, the second by .93, and the final by .15; while the per cents of gain range between 4 and 22.

TABLE XXVI

	<i>Test 46a</i>	<i>Test 45</i>	<i>Gain (Per cent)</i>	<i>Test 45</i>	<i>Test 46b</i>	<i>Gain (Per cent)</i>
Room I.	8.00	8.39	.39 (5%)	8.39	10.79	2.40 (29%)
Room II.	7.81	7.39	— .42 (1%)	7.39	10.98	3.59 (49%)

Here the initial scores differ by .50 points, the second by 1.00, and the final by .19; while the per cents of gain range between — 1 and 49.

Tests number 47-49, which were a part of the original series, will serve in some degree to measure the general abilities of the children in the two rooms. Also, as Test 47 was given first in the original series and followed immediately by Test 48, the difference between their scores indicates a gain due almost entirely to practice in taking tests.

TABLE XXVII

	<i>Test 47</i>	<i>Test 48</i>	<i>Gain of 48 over 47</i>	<i>Test 49</i>
Room I.	10.87	12.65	16%	12.04
Room II.	9.92	12.87	30%	12.41

In this test there is a maximum difference between the two rooms of .95; when the three scores of each room are added the totals differ by only .36, showing that, so far as these tests are adequate measures, the rooms differ little in their ability to understand and to follow directions.

*Group XI.* Ability to correct language errors and to point off sentences.

The tests in this group were not given in October; consequently the double check previously used does not appear as in the other tests of the series. Inasmuch as numbers 50-53 were arranged without any reference to the Horace Mann School or any other curriculum, it was only by chance that the children studied the particular details included therein during the non-grammar training; it is certain that they had no formal instruc-



tion or drill in them during the three months in which formal grammar was taught. Consequently, any improvement in the score after the period in which the children had no formal language training must be due to increased familiarity with the tests (they were repeated at the end of three months), or to incidental instruction elsewhere.

TABLE XXVIII

	<i>Test 50a</i>	<i>Test 50b</i>	<i>Gain</i>
Room I.	.228	.227	— .001
Room II.	.177	.240	.063

Table XXVIII shows Room I with a positive initial advantage, due perhaps to the chance selection of details for the test, perhaps to incidental instruction, or perhaps to better training during the previous school life. It certainly could not have been due to any training received through formal grammar, for the application of grammar to language was intentionally omitted throughout the three-month period. As compared with a possible score of 1, the records at best are poor. The situation is complicated by the fact that after three months with formal grammar Room II made a substantial gain, while Room I with language and composition just holds its own.

TABLE XXIX

	<i>Test 51a</i>	<i>Test 51b</i>	<i>Gain</i>
Room I.	— .70	— .04	.66
Room II.	— 1.86	— .28	1.58

A similar situation is presented by Table XXIX. After training in formal grammar Room I makes a better initial score; but at the end of the second period, during which it had language and composition, it makes a gain of .92 less than Room II which has been instructed not in language or composition but in formal grammar.

TABLE XXX

	<i>Test 52a</i>	<i>Test 52b</i>	<i>Gain</i>
Room I.	2.50	4.88	2.38
Room II.	2.61	4.77	2.16



The results as represented in Table XXX are such as one might expect. Room II without formal grammar makes a slightly higher initial score; then Room I without formal grammar makes a gain 10 per cent larger than Room II with it. *A priori* this test would hardly seem as likely to get correct results as the two preceding ones: they have a larger number of errors presented in isolated sentences of the text-book type, while this test has eight errors, five of which are too difficult to be detected in context by half of the pupils. This is the type of test, however, that most truly ascertains ability to correct language errors in actual life situations.

TABLE XXXI

	<i>Test 53 Ia</i>	<i>Test 53 Ib</i>	<i>Gain</i>	<i>Test 53 II</i>
Room I.	14.43	17.08	2.65	.96
Room II.	13.55	16.77	3.22	.78

Table XXXI again presents unexpected results. After formal grammar Room I presents a higher score than Room II with language and grammar; and Room II with formal grammar makes a gain of 3.22, to 2.65 made by Room I with language and composition. In April the second part of the test was presented, Room I with language and composition making a score of .96 (out of a possible 4.00), while Room II with formal grammar made a score of .78.

#### *Group XII.*

It was the opinion of the teacher that Room II learned more of formal grammar than Room I, an opinion confirmed by the test. See Table XXXII.<sup>33</sup> Though the same material was presented to both rooms, it was given more drill in Room II and hence was remembered better for the examination. It is a question, however, whether Room II had as much better an understanding of the principles taught as the score would indicate.

TABLE XXXII

	<i>Test 54</i>
Room I.	29.09
Room II.	44.76

<sup>33</sup> For a distribution of the individual scores see Table V, page 57.

## PART IV

### THE TESTS IN OTHER SCHOOLS

In order that some data might be obtained regarding the effect of grammar, formal and informal, as it is ordinarily taught, the tests previously described were given to pupils in five public schools in Illinois. These towns were selected so as to afford as fair contrasts as possible. According to general tradition and statements by the respective superintendents, schools A and C emphasize formal grammar in Grade VII; schools B and D do not. There is no information in possession of the experimenter as to exactly what grammar is taught in each school; it is probable that the difference between the kinds is largely a matter of emphasis. These schools were selected because of the facts that they are only a few miles apart, that they are good public schools, and that according to general understanding they represent schools that emphasize different types of grammar. No attempt was made to compare with any scientific exactness pupils, teachers, courses of study, or any other elements involved. The situation was taken as it was found.

In a departmental school of the fifth city the conditions are somewhat more distinct. Here the tests were given to Grade VII B, which has language and composition, and to Grade VII A, which with the guidance of an excellent text has formal grammar for a half year. These rooms will be referred to in this report as school E and school F respectively.

That there might be some data concerning the improvement due merely to general development and practice effect, the tests were given also to groups of children from Grade VI in schools A and B and to children from Grade VI A in schools C and D, promotions being made annually in the first two schools, semi-annually in the second.

The tests were given also to the sixth and seventh grades of the practice schools in two state normal schools, one in Illinois,

the other in Indiana.<sup>1</sup> Both teach formal grammar with a text in the seventh grade. They will be referred to in this experiment as schools G and H.

With the exception to be noted below the first tests were given in September, 1913, personally by the experimenter; the second by Mr. H. O. Rugg and Mr. E. E. Lewis, both trained in scientific method, following explicit and detailed written instructions. Mr. Rugg gave the tests to schools A, B, E, and F between January 28 and February 8, 1913; Mr. Lewis gave the tests to schools C, D, and G in March. Dr. C. H. Bean gave all the tests to school H, the first ones in October, the second in April. In schools C, D, E, F, and G the odd numbered tests were given first; in schools A, B, and H, the even numbered ones. Care was taken only to have the time allowed for each test the same for the schools contrasted. For all these reasons it can not be assumed that any school can be compared with any other except the one paired with it.

Of course no conclusions scientifically accurate were hoped for. But it was thought wise to give the tests to such schools as were ordinarily cited in discussions of formal grammar in order that there might be ascertained just what differences exist. With so many pupils there is sure to be a cancelation of many chance elements, and if the majority of the results supported those found at the Horace Mann School, these latter would be strengthened just so much. In these six schools there were examined in both series of tests 295 children distributed as follows:

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<sup>1</sup> In addition, it was planned to conduct the experiment with the more mature students of normal schools, but a series of disappointments made it impossible to secure enough data to warrant any report.

<i>Schools</i>	<i>Grades</i>	<i>Numbers</i>
A	VII	22
	VI <sup>2</sup>	
B	VII	20
	VI	36
C	VII B	36
	VIA	12
D	VII B	19
	VIA	22
E	VII A	22
F	VII B	22
G	VII	30
	VI	17
H	VII	18
	VI	19
		<hr/> 295

More than 400 children took the first series of tests, but because of absences, transfers, etc., about one-third were not tested a second time. For one reason and another a few tests were not given in Grade VI of school C and in both grades of school H.

### *Results*

(Throughout the following explanations the reader must remember that the upper grade in schools A, C, E, G, and H were taught formal grammar and that the other grades were not. In the tables all scores and gains after formal grammar are in italics.)

#### *Group I. Ability to see likenesses and differences.*

As measured by tests 1 and 4 the schools trained in formal grammar with one exception make less improvement in seeing likenesses and differences than do the corresponding schools with language and composition. (See Table XXXIII) School A loses what ability it showed before training, while school B gained more than 200 per cent; school C gained less than half as much as school D; and G and H are poorer in five of the six possible comparisons with the corresponding grades having no formal grammar. On the contrary, F with an abnormal initial score shows an actual loss, while E gained 4.72. In the three

<sup>2</sup> Owing to a readjustment during the year all the children in this room were transferred to another building and so could not be tested in January.

cases in which Grade VI of the school giving formal grammar was tested, it twice showed a better record than its upper grade. These results corroborate those found in the Horace Mann School.

TABLE XXXIII

<i>School</i>	<i>Test 1</i>	<i>Test 4</i>	<i>Gain</i>	<i>Test 4</i>	<i>Test 1</i>	<i>Gain</i>
A VII				2.73	0	-2.73+
B VII				2.14	6.74	4.60
VI				4.06	3.34	-.72
C VIIB	1.54	4.07	2.53			
VIA	0	1.67	1.67+			
D VIIB	0	5.26	5.26+			
VIA	0	2.86	2.86+			
E VIIA	1.90	6.62	4.72			
F VIIB	6.36	5.90	-.46			
G VII	6.20	3.48	-2.72			
VI	1.41	2.59	1.17			
H VII				.95	3.76	2.81
VI				3.65	7.06	3.41

TABLE XXXIV

<i>School</i>	<i>Test 7</i>	<i>Test 8</i>	<i>Gain</i>	<i>Test 8</i>	<i>Test 7</i>	<i>Gain</i>
A VII				1.82	1.98	.16
B VII				2.56	2.98	.42
VI				.94	2.10	1.16
C VIIB	2.90	3.10	.20			
VIA	....	....	....			
D VIIB	2.74	3.06	.32			
VIA	2.95	3.14	.19			
E VIIA	1.98	2.32	.34			
F VIIB	2.25	.95	-1.30			
G VII	2.30	1.92	-.38			
VI	1.38	1.50	.12			
H VII				2.00	2.07	.07
VI				2.88	2.32	-.56

Tests 7 and 8 show results (See Table XXXIV) which, although slightly opposing formal grammar, might have been obtained by chance. Schools A, B, C, and D show slight gains, those of B and D being larger; E shows a small gain while F is losing, but the situation in G is just the reverse; H shows a trifling gain in Grade VII, but a loss in Grade VI. Comparing the sixth grades alone (VII B of school F), we find gains of 1.16,



.19, and .12, and losses of 1.30 and .56. These results, wholly unaffected by formal grammar, show how insignificant the influence of the subject was on the grades in which it was taught. These grades show gains of .16, .20, .34, —.38, and .07; the two seventh grades without formal grammar show gains of .42 and .32. These results differ from those of the Horace Mann School. There the tests showed a decided advantage for the rooms having formal grammar.

The results of Tests 9-10, as presented in Table XXXV, favor formal grammar. School A gains 1.57 while B is gaining only .05; C loses .28 while D is losing .78; and E loses .19 while F is losing .43. G gains .30, but H at the same time loses at least .74. These tests show results almost as favorable to formal grammar as they did in the Horace Mann School.

TABLE XXXV

	<i>School</i>	<i>Test 9</i>	<i>Test 10</i>	<i>Gain</i>	<i>Test 10</i>	<i>Test 9</i>	<i>Gain</i>
A	VII				.67	2.24	1.57
B	VII				.65	.70	.05
	VI				.22	.20	— .02
C	VIIB	.98	.70	— .28			
	VIA	....	....	....			
D	VIIB	1.47	.68	— .79			
	VIA	.30	.38	.08			
E	VIIB	.35	.16	— .19			
F	VIIB	1.26	.83	— .43			
G	VII	.70	1.00	.30			
	VI	.42	.76	.34			
H	VII				.74	0	— .74+
	VI				.53	.84	.31

The tests of this group show, then, one comparison unfavorable to formal grammar, one apparently the result of chance, and one somewhat favorable. Thus they do not confirm the advantage that formal grammar seemed to have in improving the ability of the children at the Horace Mann School to see likenesses and differences—an advantage more apparent than real, it may be added, for when the amounts of gain in the major experiment are compared with those in tests 43-48, which hardly can be affected by school training, they utterly fail to be convincing.



*Group II. Ability to judge a definition.*

As shown in Table XXXVI school A makes a decisive gain over that of B, though still failing by nearly 30 per cent to reach B's score; C while maintaining a superior score fails to gain as much as D; and E gains 1.01 while F is actually losing nearly three times as much. G gains nearly 5 per cent.

TABLE XXXVI

	<i>School</i>	<i>Test 11</i>	<i>Test 12</i>	<i>Gain</i>	<i>Test 12</i>	<i>Test 11</i>	<i>Gain</i>
A	VII				2.44	10.95	8.51
B	VII				14.19	14.11	— .08
	VI				9.00	10.69	1.69
C	VIIB	1.11	6.16	5.05			
	VIA	1.33	1.25	— .08			
D	VIIB	—1.22	5.85	7.07			
	VIA	—2.48	3.95	6.43			
E	VIIA	8.70	9.71	1.01			
F	VIIB	7.91	5.00	—2.91			
G	VII	10.67	11.15	.48			
	VI	9.00	1.88	—7.12			
H	VII				....	....	....
	VI				....	....	....

TABLE XXXVII

	<i>School</i>	<i>Test 13</i>	<i>Test 14</i>	<i>Gain</i>	<i>Test 14</i>	<i>Test 13</i>	<i>Gain</i>
A	VII				.91	1.64	.73
B	VII				2.30	2.53	.23
	VI				1.56	1.72	.16
C	VIIB	1.83	1.33	— .50			
	VIA	....	....	....			
D	VIIB	1.47	1.47	0			
	VIA	1.62	.67	— .95			
E	VIIA	1.30	1.76	.46			
F	VIIB	1.27	2.00	.73			
G	VII	1.67	1.91	.24			
	VI	1.53	2.35	.82			
H	VII				.63	1.88	1.25
	VI				3.00	2.35	— .65

Table XXXVII shows that A gained decisively over B, though again failing to equal even the latter's initial score, and that C and E fail to make as good scores as D and F. The seventh grade of G gains only 30 per cent as much as the sixth,

while in school H the sixth grade loses 50 per cent as much as the seventh grade gains. Like the results in the Horace Mann School these are neutral; that is, they show no advantage for formal grammar. This means, of course, that the claims for formal grammar are not substantiated.

*Group III.* Ability to thoroughly apply a definition.

The results of tests 15 and 16, as presented in Table XXXVIII, are decisively in favor of formal grammar. School A gains 6.86 while B is losing 2.04; C gains 1.78 while D is gaining 2.53 from a much smaller initial score; and E has a loss of only 2.95 to F's 8.02. The gains by G and H of 2.63 and 11.33 respectively are also decisive. But against all this, attention must be directed to the fact that, as was remarked on page 62, these tests probably measure extreme promptness and accuracy better than accuracy alone, and to the further fact that Grade VI of school H without formal grammar made the second highest gain of all. This latter fact causes a strong assumption that other causes are far more potent here than any school subject. This assumption is thoroughly concordant with the results of these tests in the Horace Mann School.

TABLE XXXVIII

School		Test 15	Test 16	Gain	Test 16	Test 15	Gain
A	VII					0(exact)6.86	6.86
B	VII				6.88	4.84	-2.04
	VI				3.42	4.17	.75
C	VIIB	6.22	7.70	1.78			
	VIA	7.33	.80	-6.53			
D	VIIB	2.11	4.64	2.53			
	VIA	2.25	3.34	1.09			
E	VIIB	4.95	2.00	-2.95			
F	VIIB	7.64	-.38	-8.02			
G	VII	3.47	6.10	2.63			
	VI	4.59	4.50	-.09			
H	VII				-7.58	3.75	11.33
	VI				1.18	11.65	10.47

Tests 17 and 18, dealing with the same kind of material as the preceding pair of tests, resulted in an advantage for schools B and F (See Table IXL), which made scores of -.42 and 1.90 against those of -1.50 and 1.46 by A and E respec-

tively. Schools C and D are essentially tied, with scores of  $-.40$  and  $-.37$ . School G lost  $1.83$ ; school H gained  $.16$ . It is notable that the sixth grade in every case but one had a considerably lower initial score but gained enough in two cases almost to equal and in the other two to surpass the score of its corresponding upper grade. All this makes it appear that improvement was not due to formal grammar. This conclusion is in harmony with the results in the Horace Mann School.

TABLE IXL

School	Test 17	Test 18	Gain	Test 18	Test 17	Gain
A VII				7.41	5.91	$-1.50$
B VII				7.21	6.79	$-.42$
VI				5.00	6.38	1.38
C VIIB	6.06	5.66	$-.40$			
VIA	5.17	6.40	1.23			
D VIIB	6.58	6.21	$-.37$			
VIA	3.10	5.53	2.43			
E VIIIA	3.30	4.76	1.46			
F VIIB	3.91	5.81	1.90			
G VII	6.83	5.00	$-1.83$			
VI	4.17	5.77	1.60			
H VII				3.84	4.00	.16
VI				5.06	4.94	$-.12$

TABLE XL

School	Test 19	Test 20	Gain	Test 20	Test 19	Gain
A VII				.32	$-1.00$	$-.68$
B VII				.75	$-.72$	$-1.47$
VI				$-1.72$	$-.11$	1.61
C VIIB	$-.03$	$-.22$	$-.19$			
VIA	.25	$-2.20$	$-2.45$			
D VIIB	$-.53$	.05	.58			
VIA	$-1.14$	.38	1.52			
E VIIIA	$-.80$	o(exact)	.80			
F VIIB	$-1.14$	$-.33$	.81			
G VII	$-1.03$	.17	1.20			
VI	$-.94$	o(exact)	.94			
H VII				$-.58$	$-1.18$	$-.60$
VI				1.47	1.76	.29

Table XL and Table XLI show the results of four very similar tests. In the former it is shown that A loses  $.68$  while

B is losing 1.47; that C loses .19 while D is gaining .58; and that E and F gain practically the same, .80 and .81. School G gains 1.20 while school H, equally emphasizing formal grammar, loses .60. These results could hardly be more equally divided had they been derived by chance; moreover, they exactly harmonize with the results in the Horace Mann School, where half favored one side, and half the other.

TABLE XLI

	<i>School</i>	<i>Test 21</i>	<i>Test 22</i>	<i>Gain</i>	<i>Test 22</i>	<i>Test 21</i>	<i>Gain</i>
A	VII				— .64	2.85	3.49
B	VII				— .05	7.50	7.55
	VI				.11	3.99	3.88
C	VIIB	3.51	5.93	2.42			
	VIA	.24	3.60	3.36			
D	VIIB	1.11	5.59	4.48			
	VIA	1.44	5.19	3.75			
E	VIIA	1.35	4.41	3.06			
F	VIIB	6.54	4.76	—1.78			
G	VII	— .30	5.54	5.84			
	VI	4.59	5.75	.16			
H	VII				....	....	....
	VI				....	....	....

In Table XLI school A has a gain of 3.49, in contrast with B's 7.55; C gains 2.42 to D's 4.48; and E, instead of tying F, gains 3.06 while the latter is losing 1.78. These reversals are even stronger arguments than the practical balance in each set of comparisons against a transfer from formal grammar; for the tests being so similar, an influence in one should be an influence in another. The gain in the sixth grades, comparable to that in the seventh, is additional argument against a specific transfer. In the Horace Mann School the scores for the rooms having formal grammar were in three cases out of four distinctly better.

Table XLII shows that in test 23 there was a distribution of scores that might have been effected by chance. School A with —.68 was better than B with its —1.25; C with .19 was approximately equal to D with its .21; and E with —2.41 was decidedly inferior to F with its .10. Schools G and H with similar training scored —1.32 and .53 respectively. These

scores show that the children after three to five months of formal grammar did not apply even a grammar definition, if it be an unusual one, any better than the children who have not had that training.

In test 24 the distribution is even more unfavorable to the schools with formal grammar. School A with  $-3.23$  is inferior to B with its  $-.50$ ; C with  $-2.30$  is inferior to D with its  $-1.37$ ; and E with  $-4.59$  is inferior to F with its  $-2.14$ . G and H both exhibit strongly negative scores,  $-2.00$  and  $-3.71$ . In schools D and H the sixth grade makes a better score than the seventh.

TABLE XLII

<i>School</i>	<i>Test 23</i>	<i>Test 24</i>
A VII	$-.68$	$-3.23$
B VII	$-1.25$	$-.50$
VI	$-1.44$	$-4.09$
C VIIB	$.19$	$-2.30$
VIA	$-2.20$	$-4.80$
D VIIB	$.21$	$-1.37$
VIA	$-1.67$	$-.86$
E VIIA	$-2.41$	$-4.59$
F VIIB	$.10$	$-2.14$
G VII	$-1.32$	$-2.00$
VI	$0$	$-5.06$
H VII	$.53$	$-3.71$
VI	$-1.69$	$-1.53$

It may be objected that the training received in formal grammar really hinders high scoring in these tests which present for application definitions that are unsound and different from the ones given in the grammar texts. This is doubtless true; but the children were warned to apply each definition exactly, whether they thought it a good one or not. This is just the ability that formal grammar most strongly asserts that it develops. The objection is really, moreover, in a way an argument for the perfectly sound principle that training should develop specific utilitarian connections.

The scores of the schools having formal grammar make a poor showing not only relatively but absolutely as well. The possible score in each test is 4. It seems that children of

thirteen years are really too immature to learn through ordinary school work to thoroughly apply for themselves unfamiliar definitions. All these conclusions are in complete harmony with those resulting from the tests in the Horace Mann School; the evidence is against a transfer.

*Group IV.* Ability to make a rule or definition.

As in the Horace Mann School this test proved too difficult for seventh grade children. Only in schools A and B were any positive scores at all made. In test 26 school A scored .05; in test 25 A scored .27, and B scored .40. Of course from so few data the only safe conclusion is that after the training received in formal grammar the children did not possess the ability to make the rules required by these tests.

*Group V.* Ability to judge reasons.

The results of the tests of the ability to judge reasons, as displayed in Tables XLIII and XLIV, are almost wholly against any transfer from formal grammar training. School A with scores of —.36 and —3.41 is inferior to B with its .36 and —1.72; C with 5.69 and 4.84 is inferior to D with its 7.48 and 7.32; and E with 2.84 and 5.13 does no more than equal F with 2.97 and 5.08. The sixth grade in schools G and H makes

TABLE XLIII

School		Test 27	Test 28	Gain	Test 28	Test 27	Gain
A	VII				7.27	6.91	— .36
B	VII				9.40	9.76	.36
	VI				5.83	9.07	3.24
C	VIIB	5.94	11.63	5.69			
	VIA	3.33	4.00	.67			
D	VIIB	2.84	10.32	7.48			
	VIA	—1.48	8.62	10.10			
E	VIIB	5.44	8.28	2.84			
F	VIIB	5.08	8.05	2.97			
G	VII	6.72	7.62	.90			
	VI	4.59	8.00	3.41			
H	VII				6.05	2.16	—3.89
	VI				11.00	11.10	.10



better scores in Table XLIII (3.41 and .10 compared with .90 and —3.89) than the seventh, and in Table XLIV a score only slightly inferior (5.19 compared with 5.35). In the other schools the sixth grade surpasses the seventh in four cases out of six. Thus neither school training nor the slight difference in age seems to make any material difference. Certainly there is no evidence that formal grammar improves the ability of children to judge such reasons as are in the tests. In the Horace Mann School the results were somewhat more favorable to the theory of transfer.

TABLE XLIV

School		Test 29	Test 30	Gain	Test 30	Test 29	Gain
A	VII				8.82	5.41	—3.41
B	VII				9.37	7.65	—1.72
	VI				7.74	5.89	—1.85
C	VIIB	4.31	9.15	4.84			
	VIA	2.83	5.40	2.57			
D	VIIB	2.26	9.58	7.32			
	VIA	—1.29	8.14	9.43			
E	VIIA	3.10	8.23	5.13			
F	VIIB	4.82	9.90	5.08			
G	VII	4.07	9.42	5.35			
	VI	4.75	9.94	5.19			
H	VII				....	....	....
	VI				....	....	....

*Group VI. Ability to use data.*

Table XLV presents another display which, so far as the upper grades are concerned, might have been secured by chance. School A gains .13 while B is gaining .27; C loses .18 while D is losing at least .25; and E and F are practically tied with losses of .12 and .13. School G loses .21 while H gains .19. In both these two schools Grade VI makes the better final score and gain. Thus no evidence results that in such life-like situations as are presented in tests 31 and 32 there is any improvement caused by the study of formal grammar. Neither was there any such evidence from the tests in the Horace Mann School.

TABLE XLV

<i>School</i>	<i>Test 31</i>	<i>Test 32</i>	<i>Gain</i>	<i>Test 32</i>	<i>Test 31</i>	<i>Gain</i>
A VII				.10	.23	.13
B VII				.08	.35	.27
VI				.06	.23	.17
C VIIIB	.23	.05	— .18			
VIA	.17	....	....			
D VIIIB	.25	0	— .25			
VIA	.11	.05	— .06			
E VIIIA	.20	.08	— .12			
F VIIIB	.26	.13	— .13			
G VII	.33	.12	— .21			
VI	.10	.14	.04			
H VII				0	.19	.19+
VI				.08	.47	.39

*Group VII.* Ability to reason in arithmetic.

From Table XLVI is seen that school A actually loses .071 while B is gaining .074 and that C gains .130 to D's .172, but that E gains .176 while F is losing .046. When the actual scores are studied, however, it is evident that the difference between the gain of A over B is the one really significant, for D and E are bringing their scores from an inferiority into a practical equality with those of C and F. The scores of G and H seem not to be very indicative: three of the grades from normal bases make normal improvement; the sixth grade of H does unusually well in both tests.

TABLE XLVI

<i>School</i>	<i>Test 33</i>	<i>Test 34</i>	<i>Gain</i>	<i>Test 34</i>	<i>Test 33</i>	<i>Gain</i>
A VII				.571	.500	— .071
B VII				.620	.694	.074
VI				.451	.583	.132
C VIIIB	.458	.588	.130			
VIA	.317	.480	.163			
D VIIIB	.368	.556	.188			
VIA	.247	.419	.172			
E VIIIA	.400	.516	.176			
F VIIIB	.636	.590	— .046			
G VII	.293	.538	.245			
VI	.246	.312	.066			
H VII				.390	.540	.150
VI				.588	.717	.129

From Table XLVII the schools that do not emphasize formal grammar show not only greater gains but also larger initial and, with one exception, final scores. In both tables the sixth grades, with two exceptions, show smaller scores and gains than the corresponding grade above.

All these results go to emphasize those found at the Horace Mann School, that the influence of formal grammar, so far as that is the different factor in each group of classes compared, does not make for greater improvement in the ability to reason in arithmetic.

TABLE XLVII

School		Test 35	Test 36	Gain	Test 36	Test 35	Gain
A	VII				.481	.659	.178
B	VII				.690	.888	.198
	VI				.592	.621	.029
C	VIIB	.228	.607	.379			
	VIA	.191	.280	.089			
D	VIIB	.316	.756	.440			
	VIA	.166	.790	.624			
E	VIIA	.450	.623	.073			
F	VIIB	.523	.600	.077			
G	VII	.575	.608	.033			
	VI	.324	.375	.051			
H	VII				....	....	....
	VI				....	....	....

*Group VIII.* Ability to reason syllogistically.

In Tables XLVIII and IL three of the comparisons show greater gains for the schools emphasizing formal grammar and three show less. School A with losses of .01 and .49 is superior to B with its losses of .28 and .65; C with its gains of 1.43 and .34 is superior in the first comparison and inferior in the second to B with its .74 and 1.00; and E with gains of 1.25 and .42 is in both cases inferior to F, which gains 2.19 and 1.04. In Table XLVIII the gains of the seventh grades of G and H average 91.5, as compared with an average gain of .88 by the seventh grades that do not emphasize formal grammar; in Table IL the gain of the seventh grade of G is 1.02, as compared with an average gain by the others of .46. But this latter comparison, which might seem to substantiate the claims of a

formal grammar transfer, is not by itself very important when one notes that the sixth grade of G in the same table shows an initial score larger by .12 and a final score smaller by only .13 than those of the seventh grade.

TABLE XLVIII

<i>School</i>	<i>Test 37</i>	<i>Test 38</i>	<i>Gain</i>	<i>Test 38</i>	<i>Test 37</i>	<i>Gain</i>
A VII				1.46	1.45	— .01
B VII				2.88	2.60	— .28
VI				1.56	1.94	.38
C VIIB	1.00	2.43	1.43			
VIA	1.67	....	....			
D VIIB	1.11	1.85	.74			
VIA	1.00	1.14	.14			
E VIIA	1.29	2.54	1.25			
F VIIB	1.36	3.55	2.19			
G VII	1.43	2.99	1.56			
VI	1.29	1.88	.59			
H VII				1.23	1.50	.27
VI				2.83	2.47	— .36

TABLE IL

<i>School</i>	<i>Test 39</i>	<i>Test 40</i>	<i>Gain</i>	<i>Test 40</i>	<i>Test 39</i>	<i>Gain</i>
A VII				1.81	1.32	— .49
B VII				2.20	1.55	— .65
VI				2.07	1.57	— .50
C VIIB	1.69	2.03	.34			
VIA	1.33	....	....			
D VIIB	1.53	2.53	1.00			
VIA	1.05	2.19	1.14			
E VIIA	1.30	1.72	.42			
F VIIB	1.09	2.13	1.04			
G VII	1.70	2.72	1.02			
VI	1.82	2.59	.77			
H VII				....	....	....
VI				....	....	....

Taken all in all, the evidence shows again what might be a chance distribution, though somewhat unfavorable to transfer. This harmonizes with the general results at the Horace Mann School, where Table XXII showed evidence against transfer and Table XXIII evidence for it.

## Group IX. Ability to detect catches.

A glance at Table L shows an advantage of two comparisons to one for formal grammar. School A gains more than B (.92 to .26); C loses less than D (— .01 to — .14); but E loses while E gains (— .31 to .56). Both G and H also show respectable gains. A closer study, however, reveals that the average gain of schools A, C, and E is .20, while that of B, D, and F is .22, practically the same. The four sixth grades, in the meantime, with half their scores superior to those made by their respective seventh grades, show an average of .75. It would be hard to find from this test any grain of evidence that favors transfer from formal grammar. This conclusion corroborates that reached at the Horace Mann School.

TABLE L

School	Test 41	Test 42	Gain	Test 42	Test 41	Gain
A VII				2.10	3.02	.92
VI				3.19	3.45	.26
B VII				2.01	3.00	.99
C VIIB	2.65	2.64	— .01			
VIA	2.83	....	....			
D VIIB	2.84	2.70	— .14			
VIA	2.10	3.10	1.00			
E VIIA	2.30	1.99	— .31			
F VIIB	2.59	3.15	.56			
G VII	2.90	3.51	.61			
VI	2.73	4.14	1.41			
H VII				2.56	2.82	.26
VI				3.68	3.29	— .39

TABLE LI

School	Test 43	Test 44	Gain	Test 44	Test 43	Gain
A VII				16.64	17.41	.77 (5%)
B VII				15.45	18.35	2.90 (19%)
VI				12.58	16.62	4.04 (32%)
C VIIB	14.92	16.52	1.60 (11%)			
VIA	12.75	....	....			
D VIIB	14.58	15.05	.47 (4%)			
VIA	13.95	13.70	— .25 (2% loss)			
E VIIA	16.76	15.94	— .82 (5% loss)			
F VIIB	14.95	14.14	— .81 (6% loss)			
G VII	14.00	14.71	.71 (5%)			
VI	10.47	11.77	1.30 (12%)			
H VII				10.32	13.81	3.49 (34%)
VI				15.83	14.88	— .95 (6% loss)

TABLE LII

<i>School</i>	<i>Test 45</i>	<i>Test 46</i>	<i>Gain</i>	<i>Test 46</i>	<i>Test 45</i>	<i>Gain</i>
A VII				7.41	9.02	1.61 (22%)
B VII				10.45	13.40	2.95 (28%)
VI				7.74	9.17	1.43 (19%)
C VIIB	8.19	9.76	1.57 (19%)			
VIA	6.04	....	....			
D VIIB	6.84	7.41	.57 (9%)			
VIA	6.17	4.79	—1.38 (22%)			
E VIIA	8.55	6.59	—1.96 (23% loss)			
F VIIB	10.50	6.93	—3.57 (34% loss)			
G VII	7.37	10.30	2.93 (39%)			
VI	4.97	6.56	1.59 (32%)			
H VII				5.21	3.38	—1.83 (35% loss)
VI				8.11	7.91	—0.20 (2% loss)

*Group X.* Ability to make prompt and accurate associations and to follow directions.

As in the report of the tests at the Horace Mann School the results of numbers 43-46, as presented in Tables LI and LII, will in some degree indicate what improvement may result from chance variation, normal growth, and practice due to taking tests. No one, so far as is known, claims that improvement in the ability to make prompt and accurate associations is in any way affected by training in formal grammar. In Table LI the change in score ranges from a loss of 6 per cent to a gain of 34 per cent; in Table LII the range in per cents is from —35 to +39. All the tests in this group have been standardized for adults; consequently the cause of every variation in score should be sought outside the tests themselves.

The results of tests number 47, 48, and 49, which were given first in the original series at each school, will be found in Table LIII. They will serve in some degree to show the general abilities of each school in comparison with those of the other school paired with it, and also to indicate what improvement may be due to practice in taking tests. For the first purpose the totals are given of the three scores taken together. These seem to show that B is better in the ability to follow directions than A, D than C, F than E, and G than H. The sixth grade of schools C and H also seem better than their corresponding seventh grades.



In school G these tests were given in April as well as in September. The per cents of gain are: for the seventh grade, 27, 19, and 18; for the sixth grade, 25, 12, and 27. Thus again we have a record of improvement resulting from chance variation, normal growth, and practice due to taking tests.

As test 48 immediately followed test 47, which was given first in the original series at each school, the superiority of its score indicates, outside of chance variation, improvement due wholly to becoming accustomed to tests of this kind. The changes are indicated in the third column of Table LIII. They range in the first series from 7 to 34 per cent, the median and the average both being 20. The tests were given the second time in school G after the regular second series had been finished and the children were, therefore, pretty well accustomed to tests. The gains of 12 per cent in the seventh grade and zero per cent in the sixth must represent, outside of chance variation, the "warming up effect."

TABLE LIII

		(Change in per cent)			
School	Test 47	Test 48		Test 49	Total
A VII	9.72	10.64	9%	10.09	30.45
B VII	9.55	10.55	10%	12.05	32.15
VI	7.58	9.75	27%	9.36	26.69
C VIIB	8.20	10.53	28%	7.78	26.51
VIA	8.42	11.25	34%	10.08	29.75
D VIIB	9.16	10.58	16%	12.32	32.06
VIA	8.38	11.00	31%	9.81	29.19
E VIIA	9.14	11.19	22%	9.90	30.23
F VIIB	9.09	11.41	26%	11.00	31.50
G VII	a. 9.90	a. 11.90	20%	a. 12.46	a. 34.26
	b. 12.54	b. 14.04	12%	b. 14.65	b. 41.23
VI	a. 10.00	a. 11.19	12%	a. 10.23	a. 31.42
	b. 12.50	b. 12.50	0%	b. 13.00	b. 38.00
H VII	8.68	9.26	7%	9.00	26.94
VI	10.50	12.18	16%	5.94	28.62

*Group XI.* Ability to correct language errors and to point off sentences.

If we assume, as there is no apparent reason for not doing, that the children in the schools emphasizing formal grammar have had as good language training previous to entering the

seventh grade as those in the other schools, it would follow that any inferiority in their scores in the tests of this group is probably due to their failure to receive adequate training in such details as are tested. Such inferiority is found. (See Table LIV) In ten out of eleven comparisons the schools that emphasize formal grammar make a poorer showing than the schools that do not. Thus it would seem that the common schools emphasizing language and composition have at least an immediate practical advantage. In the Horace Mann School, it will be recalled, the advantage lay with the room having formal grammar in six out of nine comparisons; but the overwhelming advantage in the western schools following instruction in language and composition makes it probable that their evidence is more conclusive. This is more readily accepted when one compares the advantage of the one Horace Mann grade over

TABLE LIV

<i>School</i>	<i>Test 50</i>	<i>Test 51</i>	<i>Test 52</i>	<i>Test 53 I.</i>	<i>Test 53 II.</i>
A VII	.08	-4.27	3.36	6.64	
B VII	.22	-1.70	4.21	10.70	
VI	.06	-4.34	1.60	10.14	
C VIIIB	.12	-3.12	1.52	4.41	
VIA	.08	-4.00	....	....	
D VIIIB	.004	-1.42	1.74	8.58	
VIA	.03	-3.57	1.52	4.62	
E VIIA	.03	-3.06	-.12	8.65	
F VIIIB	.10	-2.67	3.43	Defective	
G VII	.19	-2.96	1.92	15.27	1.27
VI	.15	-2.81	1.50	1.00	....
H VII	.19	-1.26	.06	Unattempted	
VI	.19	-.65	4.35	10.00	

TABLE LV

Showing, for comparison, the amount of gain in each language test.								
<i>Horace Mann School</i>	<i>50a</i>	<i>50b</i>	<i>51a</i>	<i>51b</i>	<i>52a</i>	<i>52b</i>	<i>53a</i>	<i>53b</i>
Following formal grammar .....	.05	.01	1.16	.24			.88	
Following language ...					.11	.11		.31
<i>Other schools, average</i>								
Following formal grammar.....								
Following language ...	.03		1.55		1.51		4.12	

the other in each of these tests with the much larger averages in the other schools. (See Table LV) The advantage seems conclusively with the schools not emphasizing formal grammar.

*Group XII.*

Table LVI presents results which at first sight would seem to weaken every conclusion in Part IV. In two cases out of three the school emphasizing formal grammar is a poor second in the grammar examination, and in the third it shows only a trifling superiority over a group of children six months younger. In school G, where formal grammar is unusually well taught, six months of the subject, treated along with composition, shows by this test only a trace (1.66).

TABLE LVI

<i>School</i>		<i>Test 54</i>
A	VII	5.57
B	VII	12.70
	VI	6.97
C	VIIB	6.54
	VIA	....
D	VIIB	17.89
	VIA	8.57
E	VIIA	5.77
F	VIIB	5.00
G	VII	1.66
	VI	....
H	VII	Unatt.
	VI	Unatt.

The situation in the experiment is not so bad, however, as it seems. Formal grammar aims not at subject-matter but at method. "It is the work of making the definition," says Leonard,<sup>3</sup> "that is chiefly of value, rather than the definition itself after it has been made." This method, the result of the attempt to teach abstract logic, is not measured by test 54. Only results are asked for, results such as are usually sought in the grammar class. Of these no school has apparently taught very much. When one realizes that all a child had to do to score 10 was to discover the word connecting the two members of a

<sup>3</sup> Grammar and Its Reasons, p. 335.

compound sentence, he will realize how small the scores are. Only two schools average more than 10, and no school averages as much as 20. What we are forced to conclude from test 54 is that such matters as are asked for in the test, though prescribed by text-books, are not really taught in the first two-thirds of the seventh year, in either these schools that do or these that do not emphasize formal grammar. The only evidence we have, then, that formal grammar has received emphasis is the testimony of tradition, of those in authority, and of the text-books used.

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### SUMMARY\*

Although the tests used in this experiment pretend to be no more than rough measures of the abilities in question, it is believed that they have secured results more trustworthy than the judgments of those who have merely philosophized about the matter. Of the results reported in Part III, this is asserted with some degree of confidence, a confidence that is greatly strengthened by the amount of corroboration reported in Part IV.

As a result of this experiment it may safely be asserted that these particular children after the amount of formal grammar that they had, do not, as measured by the means employed, show in any of the abilities tested improvement that may be attributed to their training in formal grammar. To this statement there is a possible exception in the tests of Group I.

It is not claimed that some other children with more extended and better teaching of formal grammar may not show in these abilities a superiority to other similar children without this subject; but certainly it is a matter that will admit of less confident assertion than before. Indeed, the burden of proof now rests with those who believe in a strengthening mental discipline from formal grammar.

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\* All the data, including the original test sheets, reported in this experiment are on file at Teachers College, Columbia University, and under proper conditions may be inspected by any one interested.

Tables showing the unweighted scores of every pupil taking the tests used in this experiment have been printed. Copies may be had on application to the Bureau of Publications, Teachers College.

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## VITA

THOMAS HENRY BRIGGS, born 1877, at Raleigh, North Carolina. Educated at the Raleigh Male Academy, Wake Forest College (A. B., 1896), the University of Chicago (1898-1899, 1900-1901), and Teachers College, Columbia University (1911-1913). Taught English, Latin, and Greek in the Elizabeth City, North Carolina, Academy (1896-1898); and English in the John B. Stetson University (1899-1900), the Princeton-Yale, Chicago, Preparatory School (1900-1901), the Eastern Illinois State Normal School (1901-1911), and Teachers College, Columbia University (1912-1913).



TABLE 1a

H. M. S. GRADE VII ROOM I		Tests																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
		1	2a	2b	3	4a	4b	5	6a	6b	7	8a	8b	9	10a	10b	11	12a	12b	13	14a	14b	15	16a	16b	17	18a	18b	19	20a	20b	21	22a	22b	23a	23b	24a	24b	25	26a	26b	27	28																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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UNWEIGHTED SCORES

TABLE 1a

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

TABLE 1b

Room 11 Boys 1		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

TABLE 1b

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

TABLE 1b

Girls		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

TABLE 1b

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100





TABLE IIa

SCHOOL A GRADE VII Tests	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53-1	54				
Boys	1	0	0	10	0	0	5	2	0	0	-3	-12	0	0	4	4	2	8	-1	-1	2	-2	-2	1	0	0	8	11	5	11	0	.33	20	40	25	100	1	0	1	0	2	5	2	18	17	6	8	15	16	7	20	-7	2	-8	0			
2	0	0	0	0	0	10	1	5	2	0	7	-3	0	2	8	6	8	6	-2	0	1	5	-2	-6	0	0	0	0	13	3	5	.33	.33	40	40	100	60	2	1	1	2	4	5	3	20	18	16	17	3	12	6	08	-7	2	10	0		
3	0	0	0	0	0	0	4	1	0	0	4	5	0	0	10	2	6	6	-3	-3	1	-4	-2	-7	0	0	0	7	3	5	.33	0	40	40	50	20	0	1	1	0	3	5	2	19	20	4	6	13	12	9	43	-6	0	-2	0			
4	0	0	0	10	0	0	4	2	0	1	18	-3	2	2	4	6	4	7	8	-1	5	2	4	-6	1	0	0	0	2	9	11	.67	0	100	60	100	60	3	2	1	3	2	1	1	20	19	14	14	12	20	-8	4	13	12.5	0			
5	0	0	0	0	0	0	-5	-5	0	0	-11	-2	2	0	4	8	6	6	-2	-4	1	0	-1	-8	0	0	5	2	-1	11	.33	0	80	100	50	40	0	1	0	1	1	15	13	4	3	5	11	10	7	00	-4	4	8	0				
6	0	0	0	0	0	0	2	-5	0	1	3	-4	2	0	14	0	5	8	-2	1	1	-6	-3	-5	0	0	2	4	0	7	0	0	40	40	50	40	0	2	1	1	2	2	2	20	20	7	5	6	11	10	13	00	-4	2	4	0		
7	0	0	0	0	0	0	1	1	0	0	1	4	4	0	8	4	8	4	-4	-4	2	-5	-3	-2	1	0	9	2	6	8	.33	0	40	40	50	40	1	0	1	2	3	1	13	11	3	5	5	6	8	7	14	-1	6	12	10			
8	0	0	0	0	0	0	4	2	0	0	8	-2	0	0	4	8	4	8	-4	-4	3	-5	-3	-2	1	0	5	13	6	6	.67	0	40	100	75	80	1	1	1	1	2	3	3	18	20	7	7	8	10	-20	-7	0	11	2	5	0		
9	0	0	0	0	0	0	1.5	1	2	2	8	-2	0	0	10	4	8	7	1	3	3	-6	-2	-3	0	0	10	8	9	11	.33	.33	20	80	100	100	3	3	4	1	1	4	5	1	19	10	14	5	17	0	11	10	-20	-2	2	-8	0	
10	0	0	0	0	0	0	1	2	0	2	8	11	1	2	0	6	4	6	8	1	-1	-2	-3	-2	0	0	4	7	6	13	0	0	40	60	50	40	2	1	1	0	2	5	2	10	14	10	14	5	17	4	9	6	9	20	-4	6	16	0
11	0	0	0	0	0	0	2	2	1	1	21	5	4	2	16	-8	8	8	-1	5	1	6	-4	-4	0	0	9	13	9	11	.33	0	80	60	60	100	1	0	1	2	4.5	1	20	20	3	5	9	13	8	00	-1	6	18	2				
Girls	1	0	0	10	10	0	1.5	-5	0	0	10	1	2	0	16	2	5	8	0	1	0	-6	-4	-8	1	0	2	1	6	3	0	.33	60	40	80	60	0	0	0	0	1.5	2	19	18	4	5	5	5	9	15	13	13	-10	2	6	0		
2	0	0	0	0	0	10	2	-5	2	0	19	4	2	2	10	2	8	8	-3	5	6	4	0	-6	1	1	9	13	9	11	.67	0	60	80	80	80	3	2	2	3	3.5	2	20	14	16	6	11	11	11	60	-1	6	13	26.5	0			
3	0	0	0	0	0	0	3	1	0	0	26	0	2	2	10	2	6	8	-1	3	4	-6	1	-1	0	0	0	8	13	9	11	.33	0	20	20	40	40	1	0	2	3	4.5	2	20	19	7	5	9	9	10	13	-33	-1	4	4	6		
4	0	0	0	0	0	0	0	2	1	0	3	7	2	0	10	4	2	8	-3	-3	0	-6	-3	-3	0	0	-1	-6	-6	11	0	.33	80	80	100	40	2	0	1	1	3.5	1	20	19	7	4	13	13	12	13	-1	2	6	18	0			
5	0	0	0	0	0	0	1	-5	0	2	11	4	0	0	8	8	7	4	-2	1	-8	-3	-1	-2	0	0	5	8	0	6	.33	0	40	20	50	20	0	0	1	2	3	2	20	19	9	5	5	11	13	14	-1	6	14	2	5			
6	0	0	0	0	0	0	4.5	2	1	0	18	0	2	0	14	0	6	8	-3	-1	-3	6	-1	-7	0	0	6	13	9	9	0	0	40	60	100	60	1	1	1	0	2.5	2	14	13	5	3	8	10	6	25	-4	2	4	10	0			
7	0	0	0	0	0	0	4	0	0	2	18	16	4	6	14	4	6	6	-5	5	6	8	-4	-3	1	0	3	13	9	13	.33	0	100	20	75	60	3	3	3	3	4	3	20	19	19	18	20	50	-7	8	2	24.5	0					
8	0	0	0	0	0	0	2	1	0	0	14	-12	0	0	6	-8	8	8	-3	-3	-2	-1	-1	0	0	0	0	0	-1	8	7	0	0	0	40	60	00	40	2	1	1	1	1	1	14	18	11.5	4	9	3	7	27	-1	6	5	0		
9	0	0	0	0	0	0	2	-1	0	0	11	13	2	0	8	4	6	8	-1	-2	0	-2	0	0	0	0	-2	-2	9	8	0	0	60	60	75	20	1	0	1	1	2	5	2	14	13	9	5	5	7	5	9	-16	-7	-2	8	0		
10	0	0	0	0	0	0	-5	-5	0	1	20	-12	2	0	-4	2	6	8	-1	1	3	-6	4	-2	0	0	4	13	5	11	.33	.33	60	80	50	60	2	0	2	2	4.5	1	16	15	13	5	9	7	11	-20	-10	4	8	0				
11	0	0	0	0	0	0	1.5	0	0	1	14	18	0	0	0	0	5	8	1	-2	1	4	-4	0	0	0	3	13	6	8	0	0	40	20	25	00	3	1	2	1	2.5	0	15	16	11.5	13	11	9	8	-08	-4	2	2	8	0			

TABLE IIb

SCHOOL B GRADE VII Tests	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53-1	54			
Boys	1	0	0	0	0	0	2	3	0	1	0	4	4	4	2	8	8	8	-3	1	1	2	-6	-3	0	0	0	5	-3	6	9	0	0	1.00	.60	.80	.80	1	0	1	1	4	2	18	15	0	7	6	6	8	8	0	-4	4	4	10	
2	0	0	0	0	0	4	4	0	0	0	0	0	0	0	14	0	0	0	0	-1	-1	3	-1	3	0	0	0	4	5	9	6	.67	0	40	40	.60	20	2	2	2	2	12	9	13	6	4	5	5	0	-2	4	2	10				
3	0	0	0	10	0	0	2.5	2	0	1	11	6	4	2	16	4	8	8	-1	-4	3	1	-5	-2	0	0	0	9	13	9	13	.33	0	60	60	.60	60	3	2	1	2	4	3	20	16	18	5	5	11	10	11	20	-1	4	14	15	
4	10	0	0	0	0	0	4	-5	0	2	19	2	0	0	8	2	3	5	5	-2	2	7	-5	-1	0	0	10	13	9	0	.33	.33	80	60	.80	60	1	4	0	1	3.5	3	18	11	11	17	6	8	14	07	-2	6	8	12.5			
5	0	0	0	0	0	0	1	-5	0	0	13	-2	2	2	-2	8	5	5	-8	-2	2	6	-2	-2	0	0	0	2	5	-1	4	.33	0	0	40	.60	.40	.60	1	1	0	0	2.5	2	17	16	13	10	7	5	10	7	-1	6	0	10	
6	0	0	0	0	10	0	4	2	1	0	21	15	6	6	14	2	6	8	8	3	0	0	-5	2	1	0	0	7	13	9	11	0	0	80	.80	.80	1.00	2	0	2	1	5	4	20	19	18	18	9	9	11	.33	0	6	9	10		
7	0	0	0	0	0	0	3	1	0	0	15	14	0	4	16	4	8	5	5	-1	4	4	-4	1	0	0	0	8	13	9	11	.33	0	100	.80	.80	1.00	3	0	1	3	3.5	3	15	14	13	16	8	10	15	25	-1	2	7	0		
8	0	0	0	0	0	0	2.5	1.5	0	1	21	23	2	4	16	6	7	8	1	-1	4	-4	-3	-7	0	0	0	9	13	9	13	0	0	80	100	.80	.80	3	1	1	1	4	4	20	17	9	12	14	.33	2	0	17	2.5				
9	0	0	0	10	0	0	5	1	0	1	21	23	2	4	16	6	7	8	1	-1	4	-4	-3	-7	0	0	0	9	13	9	13	1.00	.33	80	.80	.80	80	3	3	3	3	4.5	3	19	18	16	18	11	13	14	07	-1	6	0	10		
10	4	0	0	0	0	0	3	2	0	0	7	5	2	2	8	-4	5	5	3	4	2	8	4	-1	0	0	-4	-4	-4	10	.33	0	80	.80	.60	.40	1	1	0	0	0	1	17	14	8	7	4	12	12	10	-4	2	-2	10			
11	10	0	0	0	0	0	2.5	1	0	0	18	15	2	0	14	10	6	8	-5	1	2	4	-3	0	0	0	0	8	13	9	13	.33	0	1.00	.60	.80	1.00	3	3	1	3	4.5	3	20	4	8	7	18	12	-1	0	13	10				
12	0	0	0	0	0	0	1.5	1	0	1	15	21	2	0	10	-6	7	8	-1	0	0	-4	-4	-1	0	0	0	3	13	9	13	.67	0	.60	.80	.80	1.00	2	3	2	3	4.5	3	15	5	16	12	-10	2	10	20						
Girls	1	10	0	0	0	0	2	1	0	0	19	16	4	0	2	6	6	7	-4	-3	-1	-2	-4	0	1	0	0	8	8	9	11	.33	0	1.00	0	.60	.60	3	2	1	1	4	5	1	20	17	19	13	8	9	14	.07	-10	2	4	18	10
2	10	0	0	0	0	0	4	3	1	1	21	16	2	0	4	6	6	6	2	-1	5	8	1	-1	1	0	10	13	9	11	.67	0	.20	.60	.80	1.00	3	2	3	1	2	4	4	20	20	17	19	12	14	.25	4	6	22	25			
3	0	0	0	0	0	0	3	2	0	1	1	15	6	4	0	-2	8	8	3	5	0	-5	-3	0	1	0	0	7	-1	9	9	.33	0	.60	.60	.60	.60	4	3	1	1	2	5	4	19	12	14	8	5	10	11	20	-4	8	4	12.5	
4	0	0	0	0	0	0	3.5	1	0	1	14	0	2	4	14	10	6	8	-1	5	6	4	-4	0	0	0	-2	13	9	10	0	.33	.33	.40	.60	.60	.60	4	2	3	2	4	2	20	14	12	15	10	11	18	.37	-1	8	14	10		
5	10	0	0	0	0	0	2.5	1	0	2	22	20	0	2	16	4	6	8	1	5	4	-6	1	1	1	0	11	13	9	11	.33	0	.40	.60	.80	.80	4	4	3	3	2	5	3	20	15	15	9	14	15	.07	-1	8	11	12.5			
6	0	0	0	0	0	0	2.5	1	0	0	11	22	2	2	16	12	6	8	3	-5	4	-8	-4	1	0	0	9	10	9	10	0	.33	.60	.80	.80	.80	3	1	1	0	4	5	2	17	7	4	5	11	12	15	.53	-3	2	17	10		
7	10	0	0	0	0	0	5	1	0	0	19	7	4	0	6	2	8	8	-1	-1	-2	6	-1	1	1	0	3	13	9	13	.67	0	1.00	.20	.60	.60	3	0	1	3	3	3	20	14	12	10	11	14	13	.07	-2	6	14	10			
8	0	0	0	10	0	0	3.5	1	0	1	21	7	2	2	10	6	6	8	-5	3	5	7	3	1	1	0	10	13	9	13	0	.33	.80	1.00	.60	1.00	3	2	4	2	4	3	20	17	19	2	14	14	14	.38	2	4	22	21.5			
SCHOOL B GRADE VI Tests	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53-1	54			
Boys	1	0	0	0	0	0	3	2	0	0	21	21	2	2	12	0	6	7	1	-3	1	-5	-6	-5	0	0	0	11	5	9	8	.67	0	.60	.60	.75	.60	1	0	0	0	4	2	2	12	8	8	10	.13	-4	4	-8	10				
2	0	0	0	10	0	0	3.5	0	0	0	11	10	4	2	12	0	8	8	1	2	8	-1	-4	0	0	0	0	11	10	9	11	.67	0	.80	.60	.75	.80	3	0	1	0	2	3	17	11	14	9	8	11	0	-1	6	14	10			
3	0	0	10	0	0	0	1.5	1	0	1	26	3	2	2	16	4	8	4	1	5	4	-4	-6	-5	0	0	0	10	13	-3	6	.67	.33	.80	.60	1.00	1.00	3	3	2	2	2	5	3	19	7	16	12	11	11	14	.23	-4	6	18	10	
4	0	0	0	10	0	0	2	0	0	1	5	4	0	2	4	2	8	5	-2	4	4	-0	-1	-9	0	0	0	10	10	3	13	0	0	.80	.60	.75	1.00	2	2	2	2	4	2	20	17	4	5	4	0	1	11	8	.07	-1	4	8	0
5	0	0	0	10	0	0	2	0	0	1	16	12	0	2	10	0	8	8	-2	5	-3	-1	-5	-5	0	0	0	10	10	6	11	.33	0	1.00	.20	.50	.20	1	0	1	2	0	2	20	14	2	4	5	0	-4	-2	-8	0				
6	0	0	0	10	0	0	2	0	0	0	18	14	2	2	16	-1	8	8	-2	0	1	0	2	-6	0	0	0	7	7	3	11	.67	0	.20	.60	1.00	1.00	2	0	1	0	4	1	19	7	17	18	4	8	8	-27	-1	4	20	10		
7	0	0	0	0	10	0	-1	0	0	0	18	11	4	2	6	8	8	6	0	4	1	-9	-5	0	0	0	0	7	13	2	0	0	.33	.20	.40	.50	.60	3	1	2	3	2	2	15	13	4	2	5	9	7	-27	-12	-10	18	5	10	
8	0	0	0	10	0	0	2	1	0	0	7	7	0	0	6	0	8	5	-8	-8	1	1	-2	-3	0	0	0	0	2	9	8	.33	0	.60	.20	.50	.80	2	2	2	3	0	0	17	12	4	3	0	7	6	-33	3	2	5	10		
9	10	0	0	0	0	0	2	0	0	0	1	19	2	2	4	0	8	5	-1	-1	0	-2	-1	-3	1	0	10	13	9	11	0	0	.40	.60	.75	1.00	4	0	2	0	5	1	15	11	3	4	5	9	9	6	-17	0	-2	8	0		
10	0	0	0	0	0	0	2	0	0	0	12	0	2	0	-4	0	6	8	1	3	2	-4	-4	-8	0	0	-1	3	3	1	0	.33	.40	.80	.75	.80	0	0	3	1	2	0	12	13	9	13.5	11	8	10	0	-1	8	13	0			
11	0	0	0	8	0	0	3	0	0	0	11	10	0	2	-8	0	8	7	3	-8	1	3	-3	-6	0	0	0	6	3	9	6	.33	0	1.00	.20	.75	.80	2	2	4	2	4	2	11	11	6	7	8	8	.07	-1	-10	22	10			
12	10	0	0	10	0	0	1	1	0	0	15	-2	2	4	2	2	8	5	-3	-8	0	-3	-1	-6	0	0	0	3	1	6	8	0	0	1.00	.40	.50	.80	3	0	1	0	5	0	19	13	12	12	8	8	7	-08	-2	-10	-1	0		
13	0	0	0	0	0	0	1.5	1	0	0	13	18	2	2	6	6	2	6	-3	1	5	-3	4	-4	0	0	0	6	-1	9	1	0	.3																								







TABLE IIIa

[illegible]

TABLE IIIb

SCHOOL D GRADE VII, B Tests.....		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53-I	54		
Boys	1	0	0	0	10	0	10	3	-1	0	1	-6	-1	2	2	-8	4	6	8	0	5	-1	5	2	2	0	0	0	4	7	5	8	.33	.00	.20	.40	.25	.80	1	0	2	2	3	3	12	14	9.5	12	5	9	8	0	-1	4	-1	15	
	2	0	0	0	10	0	0	5	1	0	0	-4	9	2	0	8	4	8	4	-1	-3	3	8	-2	-4	0	0	-2	13	3	13	.33	.00	.60	.80	.25	.60	1	2	2	2	4	2	11	14	4.5	4	5	-23	0	0	2	10				
	3	0	0	0	10	0	0	4	5	2	1	0	5	2	2	2	12	8	8	0	1	4	6	1	-1	0	0	3	13	1	0	.00	.00	.40	.60	.75	.80	1	0	2	1	3	3	18	20	8.5	14	17	-1	19	25	5	4	16	15		
	4	0	0	0	0	0	0	2	1	0	0	-6	-5	0	2	-2	0	8	8	1	-3	-8	6	-2	1	0	0	2	10	2	4	.00	.00	.20	.60	.00	.80	0	1	1	1	3.5	3	16	13	5	9	6	10	9	33	2	-2	-8	10		
	5	0	0	4	10	0	0	4	4	0	0	-4	6	2	0	14	-2	6	6	3	-1	-2	8	1	-4	0	0	-2	13	2	8	.00	.00	.80	.60	.75	.80	0	1	1	3	3.5	2	17	18	9	4	11	8	25	-1	-8	-5	10			
	6	0	0	0	0	0	0	2	.5	0	1	-10	6	0	0	-8	0	3	6	-1	0	0	8	2	2	0	0	0	1	5	5	1	.67	.00	.80	.80	.00	.80	1	2	3	1	1	3	14	15	2.5	4	0	2	4	10					
	7	0	0	0	0	0	0	5	.5	0	2	3	7	0	0	-8	16	7	6	1	5	-3	-8	-3	0	0	0	4	13	1	11	.33	.00	.80	.60	.50	1.00	1	2	2	0	4	3	13	16	12	16	19	-13	-9	0	7	45				
	8	0	0	0	10	0	0	1	1	0	1	7	10	2	4	2	6	8	8	1	3	4	4	-1	-6	0	0	4	13	5	13	.00	.00	.60	.20	.00	.80	0	0	0	3	2.5	3	14	17	5.5	7	14	15	15	-07	-1	-1	14	10		
Girls	1	0	0	0	0	0	0	3	3	0	1	-2	-15	0	2	6	2	7	7	-1	-3	1	8	4	-4	0	0	5	13	6	6	.00	.00	.60	.80	.75	1.00	3	2	2	2	4	2	14	14	12	7	7	10	15	23	-4	6	11	35		
	2	0	0	0	0	0	0	1	2	0	0	7	9	2	4	-8	-4	5	7	-1	-2	0	3	2	2	0	0	5	13	2	11	.00	.00	.00	.20	.50	.00	2	1	2	2	3	5	3	16	11	5	2.5	12	14	0	-1	2	-3	0		
	3	0	0	0	0	0	0	5	4	0	0	-10	14	2	4	8	6	8	7	-1	0	-8	5	3	2	0	0	2	-6	-1	8	.67	.00	.20	.60	.25	1.00	3	2	2	1	3	4.5	2	17	15	11.5	10	9	10	0	1	0	15	25		
	4	0	0	0	0	0	0	1	-1.5	0	0	-10	-7	0	0	10	-4	7	-2	1	-3	3	6	1	-8	0	0	0	1	-1	8	.00	.00	.20	.60	.25	.60	0	0	1	0	1	1.5	1	7	10	9.5	3	6	9	11	-33	4	2	0	10	
	5	0	0	0	0	0	0	2	1	0	0	5	13	0	0	4	-4	8	5	1	0	-1	4	2	-6	0	0	-3	10	3	11	.00	.00	.20	.20	.00	.40	0	0	1	2	1	1	15	15	7.5	6	9	11	-07	2	2	13	15			
	6	0	0	0	10	0	0	3	2.5	0	0	3	7	2	2	6	4	6	8	-3	1	1	8	3	-1	0	0	2	13	-3	13	.33	.00	.6	1.00	.75	1.00	0	1	0	3	3.5	2	16	17	3.5	10	10	15	17	-13	2	2	19	45		
	7	0	0	0	10	0	0	.5	.5	2	2	-2	16	2	2	2	0	7	8	0	3	2	2	8	0	-1	0	0	7	13	6	13	.67	.00	.00	.40	.75	.60	4	2	2	2	3	5	3	20	16	12	5	6	8	11	-12	-4	2	15	15
	8	0	0	0	0	0	0	3	1	0	1	-2	19	2	0	2	4	8	7	-3	1	2	6	8	-1	1	0	0	-1	13	6	11	.00	.00	.20	.80	.25	.80	0	1	3	3	3	14	15	5	12	12	14	11	0	2	6	20	35		
	9	0	0	0	0	0	0	1	1	0	1	-7	6	2	2	6	2	7	5	0	-3	0	8	-8	0	0	0	2	13	5	11	.00	.00	.20	.60	.25	.80	1	1	1	2	1	1	20	14	5.5	12	7	9	13	0	-7	4	7	10		
	10	0	0	0	10	0	0	3.5	.5	0	0	-10	-8	2	0	10	2	7	5	-1	-3	2	7	-3	0	0	0	-3	13	-6	10	.00	.00	.20	.40	.00	1.00	1	1	2	1	1	1	13	14	1.5	5.5	12	13	14	-23	-1	6	16	15		
	11	0	0	0	10	0	0	3	2	0	2	7	-2	2	2	4	-2	5	6	-2	3	0	6	3	-1	0	0	2	13	2	9	.33	.00	.20	.40	.25	.80	2	2	1	2	2.5	2	10	18	8	8.5	12	13	14	-23	-1	6	16	15		
SCHOOL D GRADE VI, A Tests.....		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53-I	54		
Boys	1	0	0	0	10	0	0	4	1	0	0	11	-8	2	0	-8	0	6	7	-1	-2	1	8	-3	-2	0	0	2	13	-12	8	.00	.33	.20	.20	.00	.60	0	0	1	3	3	2	15	12	3	9	5	7	6	-.09	-6	-4	1	10		
	2	0	0	0	0	0	0	5	2	0	0	-4	-3	2	0	2	4	6	6	-1	1	5	6	8	-4	0	0	0	10	-12	10	.00	.00	.00	1.00	.25	.80	0	0	0	1	2	5	3	8	5	4	10	14	9	0	-6	4	0	10		
	3	0	0	0	0	0	0	2	4	0	0	-4	-9	4	0	2	-2	6	8	-1	1	-8	6	-1	2	0	0	-1	10	-12	11	.00	.00	.40	.40	.50	.80	0	0	0	1	1	1.5	3	8	5	1.5	3	4	6	8	0	-25	-6	2	0	15
	4	0	0	0	10	0	0	4	-5	0	0	-4	-9	4	0	4	0	6	8	-1	-5	2	6	-7	3	0	0	0	4	-12	11	.33	.00	.40	.60	.25	1.00	1	1	2	1	4	4	16	19	12.5	6.5	9	14	12	0	-25	-5	4	15	10	
	5	0	0	0	0	0	0	3	3	0	1	-10	10	2	4	12	4	6	8	-1	1	0	6	-7	3	0	0	7	13	3	13	.33	.00	.40	1.00	.25	.80	0	0	0	2	1.5	3	18	15	9	3	13	15	13	0	-2	6	17	5		
	6	0	0	0	0	0	0	4	0	0	2	5	8	2	0	12	6	7	7	-3	1	0	1	4	-6	2	0	0	-1	13	6	13	.33	.00	.60	.80	.50	.80	0	2	0	1	2	4	16	12	5	5	11	14	13	.13	2	-2	5	10	
	7	0	0	0	0	0	0	3	1	0	0	-10	15	4	4	10	4	7	8	-5	2	4	8	-5	-6	0	0	5	13	6	9	.00	.00	.20	.20	.25	.40	2	0	2	0	2.5	2	14	14	2.5	3	7	11	11	0	.33	-8	8	0	10	
	8	0	0	0	10	0	0	2	0	0	1	-4	2	2	0	4	0	4	5	-2	4	2	8	-2	-4	0	0	-5	8	2	4	.00	.00	.20	.60	.50	.60	1	0	1	3	2	2	14	12	8	8	4	11	11	0	-7	-2	0	10		
	9	0	0	0	0	0	0	3	1.5	0	0	-4	2	2	0	4	0	4	7	-3	5	2	6	-3	-4	0	0	9	13	1	6	.33	.00	.20	1.00	.00	.80	4	2	2	2	3.5	3	18	14	6.5	11.5	11	13	9	.14	-1	-8	9	0		
Girls	1	0	0	0	10	0	0	1	1	0	1	-2	-17	0	0	2	-2	6	7	-1	3	-1	6	0	1	0	0	3	10	3	5	.00	.00	.40	.00	.50	1.00	1	2	2	4	1.5	3	13	14	3	3	10	10	0	-.08	-10	-2	-3	10		
	2	0	0	0	10	0	0	5	4	0	0	-10	11	0	0	8	2	7	3	0	0	0	8	-6	-1	0	0	-1	13	5	6	.33	.00	.40	.40	.00	.80	0	1	1	1	1.5	2	16	20	10	10	8	9	8	.14	-4	2	13	10		
	3	0	0	0	0	0	0	3.5	3	0	0	-10	11	0	0	-2	0	-10	-2	0	-1	0	8	-5	0	0	0	-12	13	5	5	.00	.00	.00	.00	.00	.20	0	1	1	0	1	4	12	3	3	7	9	7	-.08	-7	-2	0	0			
	4	0	0	0	0	0	0	1	2	0	1	-10	-6	2	0	-8	-8	-10	-8	1	1	2	8	-2	-6	0	0	-12	10	-12	10	.33	.00	.20	.60	.25	.20	1	1	0	2	0	2	10	13	2	3	6	9	7	-.25	-4	4	12	0		
	5	0	0	0	0	0	0	0	-2	0	1	-10	6	2	0	6	-2	-8	4	2	-1	2	4	-6	1	0	0	-3	10	-12	8	.																									







TABLE IVa

SCHOOL E GRADE VII, A Tests.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53I	54		
Boys	1	0	0	0	0	4	2	3	0	0	-3	-1	2	2	16	2	5	8	-2	1	1	-7	-5	-3	0	0	4	13	5	6	.33	.00	.60	.00	.75	.80	1	2	1	3	2	3	19	17	4	13	12	13	7	-13	-1	4	4	0		
2	0	0	0	10	0	0	1	2	0	0	19	6	0	0	8	2	4	8	-1	5	-2	8	2	-2	0	0	8	-6	6	11	.33	.00	.40	.60	.00	1.00	1	3	1	1	3	2	19	17	10	5	4	9	16	13	20	1	8	5	0	
3	0	0	0	0	0	0	3	1.5	0	0	22	-19	2	4	8	2	7	8	3	5	2	8	-6	-0	0	0	7	13	6	13	.67	.00	1.00	.40	.50	1.00	2	2	2	1	4	2	12	18	12	12	12	14	11	27	2	-2	9	0		
4	0	0	0	2	0	0	1	.5	0	0	4	5	0	0	-8	-8	-2	-2	-2	-2	1	6	-1	-6	0	0	0	0	6	3	.33	.00	.40	.40	.25	.80	1	1	1	1	3	1	11	13	3	5	5	9	9	43	-8	0	0	0		
5	0	0	0	0	0	0	3	-.5	0	0	3	-2	0	0	-10	6	3	2	2	-3	-2	2	-4	-5	0	0	0	7	2	3	.00	.00	.20	.40	.00	.40	2	1	1	0	2	1	15	12	5	2	5	11	6	-13	-14	-6	-8	0		
6	0	0	0	10	0	0	1.5	-.5	0	2	14	17	2	4	12	4	5	8	-3	2	-1	6	-1	-6	0	0	1	10	6	8	.33	.33	.60	.60	1.00	.40	1	1	2	2	1	2	15	13	10	8	6	10	10	13	2	-2	-1	2		
7	0	0	0	10	0	0	1.5	.5	0	0	17	17	0	0	8	2	6	6	0	0	2	7	-5	-6	0	0	5	5	13	13	.33	.00	.80	.60	.60	.60	3	1	2	2	1	1	18	20	10	7	7	11	13	10	25	-1	2	9	0	
8	0	0	0	4	0	0	2.5	2	0	0	-1	13	4	4	10	-8	5	8	5	4	2	4	3	-6	0	0	-1	10	6	10	.67	.33	.60	1.00	1.00	.80	1.00	1	2	1	1	2	2	17	17	17	7	4	12	14	18	.00	-3	2	13	10
9	10	0	0	10	0	0	2	3	1	0	17	16	4	8	-2	8	4	7	1	-2	2	4	-1	-6	0	0	5	13	5	9	.67	.00	.80	.60	1.00	1.00	2	1	0	1	2	2	17	17	7	11	7	4	4	-25	-4	-8	3	10		
10	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	6	0	-8	0	4	0	0	0	0	0	0	0	-1	0	0	0	.20	.00	.00	.00	2	0	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0			
Girls	1	0	0	0	0	0	3	3	0	0	20	18	0	2	2	-8	6	8	2	-3	2	8	-5	-2	0	0	7	13	2	11	.00	.00	.00	.00	.25	.20	1	1	1	2	1	1	17	16	10	3	10	10	8	.17	0	2	13	10		
2	0	0	0	10	0	0	1	1	0	0	8	-9	2	2	0	2	3	6	1	-1	1	2	1	-9	0	0	7	10	-3	5	.00	.00	.20	1.00	.25	.60	0	1	1	1	1	1	16	14	6	5	6	8	11	12	-1	6	0	0		
3	0	0	0	0	0	0	2	.5	0	1	-3	17	2	0	4	2	3	-8	0	-2	2	-1	-2	-7	0	0	0	13	0	13	.00	.33	.60	1.00	.25	.60	2	3	1	1	0	0	1	19	20	10	8	14	15	19	-50	2	-2	7	0	
4	0	0	0	10	0	0	3	.5	0	0	16	5	2	0	-4	2	6	8	-1	-2	-5	8	-3	-7	0	0	0	11	6	13	.00	.00	.00	1.00	.75	.60	0	2	3	0	3	2	20	18	4.5	7	9	10	8	.27	2	4	16	0		
5	0	0	0	0	0	0	3	0	0	0	5	0	0	0	16	0	4	0	-2	0	0	0	0	0	0	0	8	-6	0	.00	0	.40	0	.75	0	1	0	1	0	3	0	15	0	5.5	0	9	7	11	0	0	0					
6	0	0	0	0	0	0	-3	0	0	0	2	0	2	0	2	8	-18	5	-5	0	0	4	0	0	0	0	5	1	0	.00	0	.80	0	.25	0	1	0	0	0	2	0	11	0	2.5	0	7	9	7	0	0	0					
7	0	0	0	10	0	0	3	-.5	0	0	9	20	2	0	6	8	6	7	-3	-1	0	4	-4	1	0	0	-6	10	3	2	.00	.33	.60	.20	.75	.00	1	1	1	1	1	2	19	16	12	7	13	8	13	13	3	-10	16	0		
8	0	0	0	0	0	0	3	0	0	0	2	0	2	0	6	0	6	0	0	0	-8	0	0	0	0	0	6	0	6	0	.33	0	.00	0	.50	0	2	0	1	1	3	0	19	16	12	11	6	11	12	0	0	0				
9	0	0	0	0	0	0	2	1	0	0	10	18	0	2	6	0	5	6	-1	5	5	5	0	-6	0	0	6	13	9	11	.00	.00	.20	.60	.25	.60	1	2	2	1	3	2	18	16	15	9	11	14	15	-14	-12	4	20	20		
10	0	0	0	0	0	0	2	0	0	0	19	0	2	0	4	2	-1	-1	-2	-1	0	5	-6	-2	0	0	7	4	6	7	.00	.00	.20	.40	.50	.60	2	2	2	2	3	2	15	0	6	0	9	10	5	0	0	0				
11	0	0	0	10	0	0	2.5	2	0	0	7	11	0	2	14	0	-1	-1	-2	-1	0	5	-6	-2	0	0	7	4	6	7	.00	.00	.20	.40	.50	.60	2	2	2	2	3	2	20	17	5.5	3	8	11	7	.13	-9	-2	15	0		
12	10	0	0	0	0	10	2	1	0	0	7	11	0	2	10	0	6	2	0	-4	5	2	-4	-6	0	0	9	5	9	6	.33	.00	.20	.20	.00	.60	1	1	2	2	4	1	20	14	14.5	3	6	11	8	.25	-11	-2	17	0		

TABLE IVb

SCHOOL F GRADE VII, B Tests.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53-I	54	
Boys 1	10	0	0	10	0	0	2	..	0	..	24	12	0	2	6	4	8	7	-5	-2	2	-2	1	3	0	0	-4	11	6	4	.33	.00	.80	.60	.00	.80	0	1	1	2	2	3	15	18	10	3	6	9	13	13	-4	6	..	0	
2	0	0	0	10	0	0	3.5	1	0	0	9	20	2	8	-2	2	7	8	-3	-4	3	8	1	2	0	0	6	13	9	11	.33	.33	.80	.60	.50	1.00	4	3	1	2	2	3	10	15	11.5	11	8	14	10	-25	-4	0	..	10	
3	0	0	0	10	0	0	2	-5	0	0	7	-14	2	0	10	2	7	7	-1	-1	2	2	0	-2	0	0	6	-4	5	2	.33	.00	.60	.20	.50	.20	2	3	2	1	2	1	18	13	8.5	5.5	7	12	9	.00	-6	4	..	0	
4	10	0	0	0	0	4	3	.5	0	0	7	-4	2	0	2	-8	8	-1	-8	-3	4	7	-3	2	0	0	2	7	9	13	.33	.33	.20	.20	.75	.60	2	2	0	1	1	0	12	12	4	5	3	4	7	7	.09	-10	4	..	10
5	10	0	0	2	0	0	1	1	1	0	-13	3	2	6	6	4	6	0	-1	0	6	5	1	-9	0	0	-1	13	5	10	.33	.33	.80	.40	1.00	.00	0	2	2	1	3.5	4	11	10	9	4	9	13	9	-33	-2	-4	..	0	
6	0	0	0	0	0	0	2	-1	0	..	-6	12	2	0	14	2	0	4	-1	-2	4	4	-2	1	0	0	2	7	-9	13	.00	.00	.40	.60	.25	.80	0	2	0	2	4	2	16	12	12	6	8	8	9	.27	-1	2	..	0	
7	0	0	0	0	0	0	1	1	0	..	-3	18	0	0	-2	-6	0	-1	-1	-1	2	3	1	3	0	0	2	13	3	11	.00	.00	.40	.60	.75	.80	0	1	2	1	0	0	0	13	3	6	5	9	8	.09	-7	2	..	0	
8	0	0	0	10	0	10	3	.5	1	..	4	-1	2	2	16	2	6	7	-2	4	3	0	1	1	0	0	5	13	8	11	.67	.33	.60	.60	1.00	.80	2	3	1	2	4.5	7	19	14	14	11	12	13	10	.00	1	2	..	20	
9	0	0	0	10	0	0	2.5	1	0	2	21	15	4	4	16	2	7	8	-3	5	8	7	2	-4	0	0	7	13	9	13	1.00	.00	.80	.80	1.00	.60	1	3	3	4	4	3	16	18	13	10	12	14	15	.66	-1	8	..	0	
10	10	0	0	10	0	0	3	-1.5	1	1	20	4	0	2	16	4	8	8	2	5	2	4	2	-8	0	0	8	13	6	13	.67	.33	.80	.80	.75	1.00	2	2	1	0	4	3	19	20	17	7	14	15	18	.46	-1	6	..	10	
Girls 1	0	0	0	10	0	0	3	1	0	..	2	4	2	0	4	-8	0	8	-2	-3	-2	8	0	1	0	0	1	2	2	13	.00	.00	.60	.40	.25	.20	1	3	0	0	2.5	3	10	7	9	6	6	10	6	-.17	-4	0	..	0	
2	10	0	0	..	0	..	2	..	0	..	3	..	2	..	-2	..	0	..	0	..	4	..	..	..	0	..	1	..	9	..	.00	..	.40	..	.00	..	1	..	2	..	2.5	..	20	..	13.5	..	9	11	11	..	..	..	0		
3	10	0	0	0	0	0	2	1	0	1	1	13	0	0	10	-2	0	7	-1	-3	2	4	2	-2	0	0	-1	7	-9	11	.00	.00	1.00	.80	.75	.8	2	0	1	1	1.5	2	13	10	11	..	5	9	12	14	.40	-10	8	..	0
4	0	0	0	10	0	0	4	0	0	..	17	-3	0	2	4	2	0	5	-1	-1	1	4	-1	-3	0	0	6	7	9	11	.00	.33	.40	.60	.25	.8	2	1	0	1	2.5	3	17	11	12	.5	5	6	7	8	.43	-10	2	..	0
5	0	0	0	0	0	0	3	.5	0	1	7	7	2	0	8	-4	7	8	-2	1	-2	6	-2	-6	0	0	1	-4	5	6	.00	.00	.80	.40	.25	.4	1	0	0	2	2.5	2	17	14	9	7	9	9	8	-.14	-1	6	..	0	
6	0	0	0	10	0	0	0	1	0	..	14	24	2	2	-2	-2	0	0	3	0	3	2	0	-2	-1	0	0	1	10	9	11	.00	.00	.40	.80	.50	.00	0	2	2	2	3.5	2	17	14	4	4.5	11	12	12	.14	..	..	10	
7	10	0	0	0	0	0	1.5	1	0	..	4	4	0	2	10	0	8	5	-1	-3	3	6	2	1	0	0	3	13	2	11	.33	.00	1.00	.80	.75	.60	2	3	3	..	1.5	3	19	14	9	10	9	13	14	25	-1	6	..	0	
8	0	0	0	0	0	0	5	1	0	..	6	-5	0	6	12	8	7	8	-1	-5	2	3	-1	-7	0	0	7	-1	-4	11	.33	.00	.60	1.00	.75	1.00	3	3	1	3	2.5	3	20	20	16.5	10	13	14	13	25	2	2	..	10	
9	0	0	0	10	0	0	2.5	1	0	1	15	2	2	2	12	-2	7	7	1	5	-2	7	0	0	0	0	6	3	9	6	.33	.33	.80	1.00	.50	.80	1	3	1	2	2	3	18	18	..	11	13	12	17	-.38	4	8	..	10	
10	0	0	0	0	0	0	0	0	0	2	8	-13	0	0	4	-8	0	7	1	1	2	7	-2	-6	0	0	2	7	2	5	.00	.00	.00	.00	.25	.40	0	1	0	1	3	2	14	12	8.5	6	10	9	9	.09	-1	2	..	0	
11	0	0	0	0	0	0	-.5	.5	0	1	15	4	2	0	10	0	0	4	-1	2	4	6	0	-6	0	0	3	13	9	11	.33	.33	1.00	.40	.00	.40	1	2	0	2	3.5	2	9	13	9.5	1.5	11	12	8	.18	-1	2	..	0	
12	0	0	0	10	0	0	4	.5	1	1	12	-16	2	4	16	4	0	8	5	-5	-2	8	2	-5	0	0	7	13	6	11	.33	.00	.80	.80	.75	.60	3	3	1	3	2.5	2	19	19	15.5	13	9	16	14	-.27	-1	2	..	0	







TABLE Va

SCHOOL G. GRADE VII Tests		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47a	47b	48a	48b	49a	49b	50	51	52	53I	54			
Boys	1	0	0	0	0	0	0	3	2	0	2	3	-12	0	2	-8	12	8	-	-2	-2	3	4	-2	-1	0	0	7	1	6	13	33	33	00	40	75	00	2	2	1	2	3	5	3	14	16	5	8	11	11	9	13	8	9	29	-10	0	22	2	5	
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	3	10	0	0	0	0	0	4	1	0	2	21	-	0	2	-8	12	8	-	-2	-2	3	4	-2	-1	0	0	6	6	13	33	33	00	40	75	00	2	2	1	2	3	5	3	14	16	5	8	11	11	9	13	8	9	29	-10	0	22	2	5		
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Girls	1	0	0	0	0	0	0	1.5	5	0	2	9	0	0	0	-8	8	8	-	-8	0	8	1	-2	0	0	1	1	6	13	67	00	40	80	1.00	1.00	2	2	1	2	3	5	3	11	15	5	14	11	13	13	16	12	11	17	4	-10	16	0	2.5		
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	7	0	0	0	0	0	0	3	5	2	0	8	-1	0	10	-	7	8	-	-3	1	1	7	-1	-7	0	0	9	10	00	00	00	60	60	75	1.00	3	1	3	3	2	2	3	5	3	11	15	5	14	11	13	13	16	12	11	17	4	-10	16	0	2.5
	8	0	0	0	0	0	0	3	5	2	0	8	-1	0	10	-	7	8	-	-3	1	1	7	-1	-7	0	0	9	10	00	00	00	60	60	75	1.00	3	1	3	3	2	2	3	5	3	11	15	5	14	11	13	13	16	12	11	17	4	-10	16	0	2.5
	9	0	0	0	0	0	0	3	5	2	0	8	-1	0	10	-	7	8	-	-3	1	1	7	-1	-7	0	0	9	10	00	00	00	60	60	75	1.00	3	1	3	3	2	2	3	5	3	11	15	5	14	11	13	13	16	12	11	17	4	-10	16	0	2.5
	10	0	0	0	0	0	0	3	5	2	0	8	-1	0	10	-	7	8	-	-3	1	1	7	-1	-7	0	0	9	10	00	00	00	60	60	75	1.00	3	1	3	3	2	2	3	5	3	11	15	5	14	11	13	13	16	12	11	17	4	-10	16	0	2.5
	11	0	0	0	0	0	0	0	-5	0	0	-1	5	0	2	-4	7	8	-	-2	1	8	8	-5	-2	0	0	-1	13	00	00	00	20	20	25	60	40	0	1	2	3	5	3	11	15	5	14	11	13	13	16	12	11	17	4	-10	16	0	2.5		
	12	10	0	0	0	0	0	2	3	0	0	7	4	4	0	-2	6	2	-	-2	2	8	8	-5	-2	0	0	-1	13	00	00	00	20	20	25	60	40	0	1	2	3	5	3	11	15	5	14	11	13	13	16	12	11	17	4	-10	16	0	2.5		
	13	0	0	0	0	0	0	2	3	0	0	-1	5	0	0	-2	6	2	-	-2	2	8	8	-5	-2	0	0	-1	13	00	00	00	20	20	25	60	40	0	1	2	3	5	3	11	15	5	14	11	13	13	16	12	11	17	4	-10	16	0	2.5		
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	15	0	0	0	0	0	0	2	3	0	0	-1	5	0	0	-2	6	2	-	-2	2	8	8	-5	-2	0	0	-1	13	00	00	00	20	20	25	60	40	0	1	2	3	5	3	11	15	5	14	11	13	13	16	12	11	17	4	-10	16	0	2.5		
	16	0	0	0	0	0	10	2	-	0	0	7	14	4	-	-8	-2	7	1	0	-1	-2	3	-4	-1	0	0	6	13	3	11	00	00	1.00	60	25	80	2	2	2	2	19	13	5	12	14	14	15	11	20	50	-1	-	2	5						
SCHOOL G. GRADE VI Tests	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47a	47b	48a	48b	49a	49b	50	51							

TABLE Vb

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SCHOOL H GRADE VII Tests.....		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53I	54																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
Boys	1	10	0	0	0			2	1	0	1			2	0	0	-2	-8	2	-3	0			2	-2	0	0	8	-6			0	0	60	60			0	0			1	3	7	1	1	4	6	5	6	7	45	-10	-9	0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
	2	10	0	10	0			1	5	0	0			2	0	0	2	7	2	-1	-1			1	-9	0	0	0	13			0	0	0	0	0	0	0	0	3	5	3	11	10	1	4	6	5	6	7	45	-10	-9	0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
	3	0	0	0	0			1	5	0	1			2	0	0	2	7	2	-1	-1			1	-9	0	0	0	13			0	0	0	0	0	0	0	0	3	5	3	11	10	1	4	6	5	6	7	45	-10	-9	0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
	4	0	0	0	0			3	1	0	1			0	0	4	0	6	0	-2	-4			2	-7	0	0	0	-4			2	1	30	60	80	100	1	0	1	1	1	4	6	5	6	7	45	-10	-9	0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
	5	0	0	0	0				1.5	0	1			0	0	12	-2	5	4	1	-4			0	0	0	0	-6	7			1	0	33	60	80	100	1	0	1	1	1	4	6	5	6	7	45	-10	-9	0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
	6	0	0	10	0			1	-1	0	1			2	0	12	-8	6	6	-2	0			2	-6	0	0	2					33	60	80	100	1	0	1	1	1	4	6	5	6	7	45	-10	-9	0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
	7	0	0	0	0			1	5	0	0			2	2	-8	-8	-8	7	-8	-1			-5	-6	0	0	-1	13			33	60	80	100	1	0	1	1	1	4	6	5	6	7	45	-10	-9	0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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	9	0	0	0	0			2	2	0	0			4	4	16	2	5	2	-3	5			-1	1	0	0	-1	13			33	60	80	100	1	0	1	1	1	4	6	5	6	7	45	-10	-9	0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
Girls	1	0	0	0	4			3.5	1	0	2			4	0	-8	-8	7	-5	0	-1			4	-4	0	0	0	10			33	60	80	100	1	0	1	1	1	4	6	5	6	7	45	-10	-9	0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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